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Contributions.

The Fox Corrugated Furnace.

45 BROADWAY, N. Y., May 23, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In reply to Mr. George S. Strong's letter in your issue of the 18th inst., I would say that the furnaces for his engine No. 444 were ordered prior to August, 1886, the date upon which I undertook the agency for the Leeds Forge Co. in this country, and that we make our furnaces up to 9 ft. long in one piece, but do not recommend greater lengths than 8 ft. 6 in., and further that so far as I have been able to ascertain, when the furnaces for 444 were ordered nothing was stated as to the use to which these furnaces were to be put.

I would state that no corrugated furnaces are made more than 9 ft. long, and, therefore, the Minneapolis furnaces must be in two pieces either welded or riveted together.

I enclose a copy of a letter from Mr. Strong written in October last, which shows what Mr. Strong thought of the Leeds Forge Co.'s furnaces, and in conclusion would ask Mr. Strong, why, if he has such a high opinion of the furnaces manufactured in this country, he did not have those for 444 made in this country? J. BEAVOR WEBB.

[COPY OF LETTER.]

From George S. Strong, Chief Engineer Strong Locomotive Company, 239 Broadway, New York, Oct. 22, 1887.
To the Leeds Forge Company, Limited, J. Beavor Webb, Agent, New York.

Yours of the 21st at hand, asking about the Fox corrugated furnaces in locomotive 444 of L. V. R. R. In answer would say that there has been no failure of the furnaces on this locomotive, but that trouble was caused by the lapped and riveted seams at the back end of the furnaces, where they joined the junction between the furnaces and the combustion chamber, and in the laps in the junction piece, and in the junction of this piece with the combustion chamber. This difficulty was due to the very high temperature, causing these laps to become overheated, and raising the calking edge, and was not due to the contraction and expansion as so many have supposed, as the seams did not leak on the underside, or anywhere but right where the flame in passing over the bridge wall came in contact with them. You can get some idea of the intensity of this flame when you consider that the boiler gave an indicated horse-power for about one square foot of heating surface and 30 horse-power per square foot of grate, and that probably 70 per cent. of the water was evaporated around the fire and combustion chambers. Our reason for replacing the furnaces is that in fitting a new junction piece between the fire and combustion chambers, and forming it with the Adamson joint, there was not enough stock for flanging on the old furnaces or combustion chamber, and we are having new ones made. By this new construction we get all rivets out of the fire and have no laps exposed, and I think will have a very durable boiler. Very truly, (Signed), GEO. S. STRONG.

American Locomotives in New South Wales.

The following correspondence reached us too late for use in the *Railroad Gazette* last week, but the main facts had been obtained earlier, and were used in a brief editorial touching the matter. The immediate reason for asking the information from Messrs. Burnham, Parry, Williams & Co., proprietors of the Baldwin Locomotive Works, was the appearance in *Engineering* (London) of an article of which the main points were summarized in the *Railroad Gazette's* editorial last week. The letters which follow give sufficient answer to the allegations, direct and implied, of *Engineering*, so far as the American builders and their product are concerned:

Baldwin Locomotive Works,
Burnham, Parry, Williams & Co.,
PHILADELPHIA, May 23, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The order for locomotives now pending for the New South Wales railways has been the subject of so much controversy, both in England and the Australian colonies, that echoes of it have from time to time reached this country, and some of your readers may be familiar with its history. With a desire to test the merits claimed for locomotives of American design, the Minister for Works of the New South Wales Government in 1877 ordered one sample American type locomotive, and in 1878 one additional American type and two Consolidation locomotives. These were followed by an order in 1879 for nine additional Consolidation locomotives.

These engines were in accordance with the most approved practice at that time, but it is not surprising that during the construction of upwards of 1,000 locomotives of that type, which we have built during the intervening years, improvements should have occurred to us of which we desired to give the Government of New South Wales the benefit, should they determine to favor us with their commands for additional locomotives of the same class. In no case, however, have we intimated that the Consolidation type is obsolete or unfit for repetition. On the contrary, we have uniformly urged its adoption as having proved itself best adapted to heavy freight service on severe grades, and at this time a large proportion of the most prominent railroads in the United States have come to the same conclusion. The changes suggested are of detail only, and are not intended to affect the interchangeability of the new engines with those hitherto furnished by us. Enclosed we hand you copies of letters addressed by us to the Commissioner for Railways and also to Mr. Thomas Midelton, the Locomotive Engineer for Tramways, in this connection. The parts omitted refer only to prices, which need not be made public. We know of no other utterances made by us on this subject. BURNHAM, PARRY, WILLIAMS & CO.

The first letter, dated May 31, 1884, is addressed to the Hon. Charles A. Goodchap, Commissioner of Railways, Sydney, New South Wales, and is as follows:

In view of your requirements for additional locomotives for heavy goods traffic, it may perhaps be proper for us to call your attention to improvements which have been made in the Consolidation type since the construction of those last furnished by us for your Government in 1879. Since then the use of engines of this type on American railroads has largely increased, and we have built of this pattern alone upward of 500 locomotives. The most careful study has been given to all the details of design, and the operation in service has been carefully watched. While the locomotives built for your railways in 1879 embodied the most approved practice at the time, it is but natural that important improvements in details should have been since effected.

We inclose blue-print of an outline drawing of our present standard locomotive, and ask your attention to the following particulars:

1. Reduction of the total wheel base from 22 ft. 10 in. to 21 ft. 6 in.
2. Reduction of the driving wheel base from 14 ft. 9 in. to 14 ft.
3. By placing the fire-box over the frames, and making it flush with their outer faces, an inside width of 43 in. is obtained, allowing, while giving an increased grate area, a reduction of its length to 103½ in. Dimensions of grates of your present Consolidated engines are 119 in. length, by 33 in. width, inside. In this connection we may remark that we propose to make the fire-box deeper than shown on the print, by raising the barrel of the boiler, as shown by the inclosed photograph of Shenandoah Valley Railroad locomotive No. 48. This, it is found, conduces to economy of fuel, without injuring the stability of the locomotive on the track.
4. By lengthening the flues to 12 ft. 8½ in. instead of 11 ft., the heating surface of flues is increased from 1,129 to 1,337 sq. ft., while the total heating surface is increased from 1,277 to 1,453 sq. ft.
5. By carrying the connecting rods back to the third pair of driving wheels, their length is increased to 9 ft. 7 in. The thrust against the crosshead and guides is thus largely reduced, with consequent less wear on main rod brasses and crosshead gibs.
6. The extended smoke-box, in connection with a straight stack, is now generally in use in this country. It relieves much of the back pressure on the cylinders, while being one of the most efficient spark arresters known. Its construction is fully explained on pages 180 to 185 of the "Proceedings of the American Railway Master Mechanics' Association," 1883, copy of which we send you by book post, same mail.

The inclosed photograph of Duluth & Iron Range, No. 7, shows a locomotive precisely in accordance with the inclosed blue print. The inclosed photograph of Shenandoah Valley, No. 48, shows the modification which we propose to obtain increased depth of fire-box. The inclosed photograph of locomotives Great Southern, Western & Richmond Railway, shows your consolidation locomotives built in 1879, for comparison.

The second letter, dated Dec. 8, 1887, is addressed to Mr. Thomas Midelton, Locomotive Engineer for Tramways, Randwick, Sydney, New South Wales. It is as follows: Your valued favor of Nov. 2 was received on the 3d inst. We entirely concur with you in your recommendation of suitable standard types of locomotives for passenger and freight service on your railways, and we congratulate you upon having convinced your associates of the wisdom of adopting these types. By the last mail we sent you blue-prints of the general drawing and cross sections of your Mogul, which we trust have duly reached you. We regret that we have not tracings of the other engines furnished your railways, but would have to make them.

Since the Consolidation and American type locomotives to which you refer were built, the advancement in locomotive practice in this country has been so conspicuous that we feel that we would not be doing justice to your government nor to ourselves to furnish drawings for perpetuating these engines. It is now usual to provide much larger heating surface for given cylinders, which conduces to much greater economy of fuel, and by reason of the ampler adhesion thus gained, the wear and tear from slipping the driving wheels is reduced to a minimum. This will be of the utmost value on your lines, where we understand the track is not always in the

condition for adhesion, owing to the heavy mountain dews. The increased weight of boilers is accompanied by enlarged bearing surfaces, and by many improvements of detail.

Consolidation Locomotives.—We inclose copies of correspondence had with the Commissioner for Railways some two and a half years ago, respecting certain of the improvements above referred to in engines of this type. Referring to Mr. Scott's objections, we would say that we have since adopted a much more secure method of attaching the boiler to the frames than that shown by the blue print accompanying our letter of May 31, 1884. We inclose a blue print, not made especially with reference to the engines described by inclosed specification No. 3,534, which will, however, serve to show the present arrangement. In addition to the expansion link supporting the forward part of the fire-box, the rear of the fire-box is securely held by stout cast-iron plates, which give ample bearing surface, allow free expansion of the boiler and lock the boiler to the frames as firmly as can be desired. The engine proposed by inclosed specification No. 3,534 has larger heating surface than that offered in 1884, say 1,511 sq. ft. in the tubes, 146 sq. ft. in the fire-box; total, 1,657 sq. ft. It will be noticed that the tubes now proposed are 13 ft. 1 in. long instead of 12 ft. 8½ in.

American Type Locomotives.—We inclose specification No. 3,535, describing engines with enlarged heating surface, such as we would now recommend. The heating surface of this engine is: tubes, 1,487 sq. ft.; fire-box, 136 sq. ft.; total, 1,623 sq. ft.

Export Rates and the Produce Exchange.

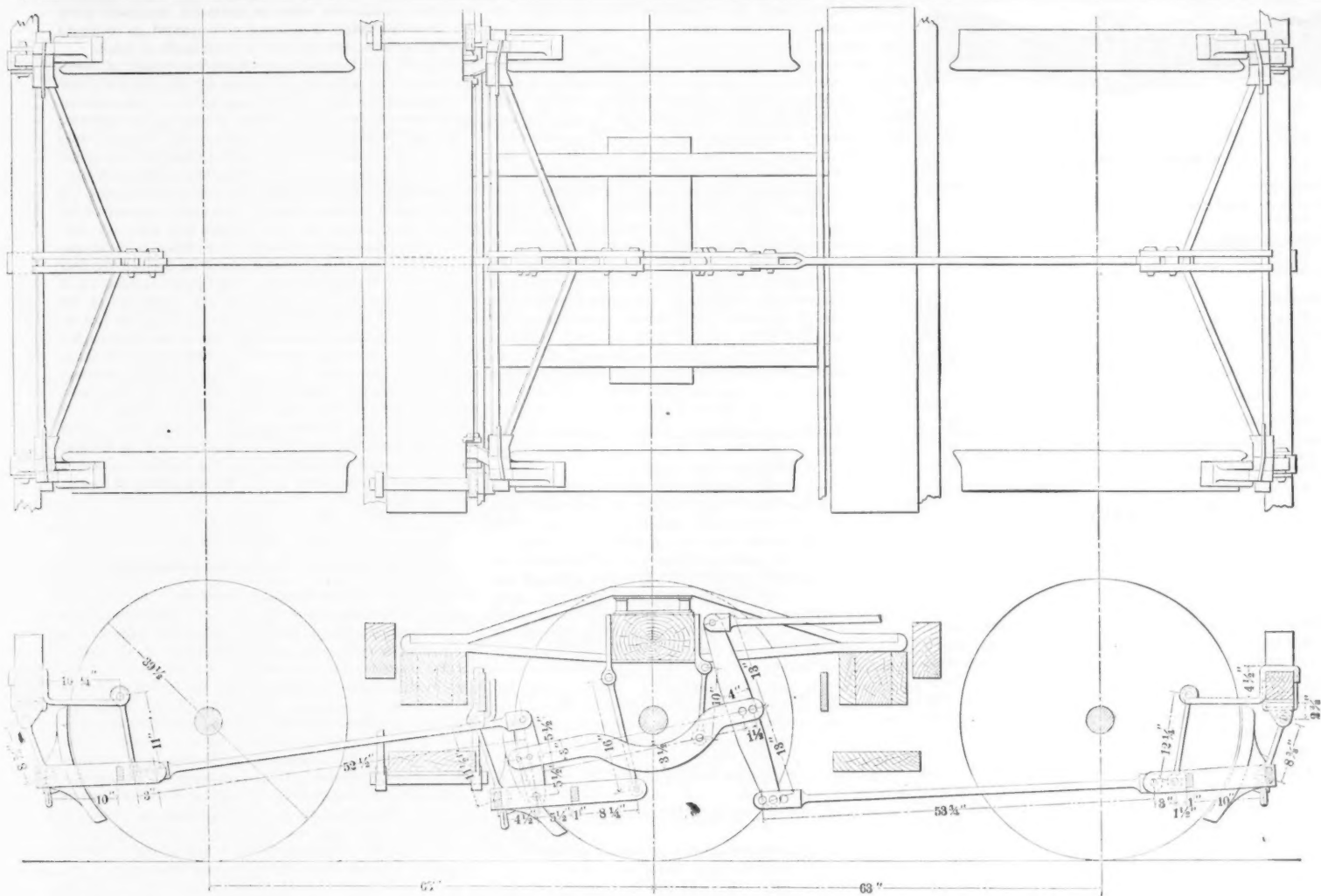
TO THE EDITOR OF THE RAILROAD GAZETTE:

The Produce Exchange of New York, having appealed to the Inter-state Commerce Commission against railroad discrimination in making the export rate lower in proportion than the domestic rate, is catching it on all sides. Down-town journals, out of town papers, and the *Railroad Gazette* too, have joined the chorus. The profits of the middlemen at the seaboard have been cut into, and naturally (it is suggested) they would be willing that all the business of the country should suffer so that these middlemen may continue to reap their old harvest! It does not seem to me that this is quite a fair statement of the case, or that it covers all there is of the problem, or of the Produce Exchange complaint. I do not understand that the Exchange demands arbitrarily the same rate on domestic breadstuffs and provisions as the rail proportion on exports. If this is done without reservation, it but invites defeat before the Commission and at the bar of public opinion. The reasons for this view every reader of your journal knows already. But on the other hand, consider the value of the interests imperilled. The immense advantages for doing an export business which money and nature have given this port, are to count for nothing. Experience, capital, facilities, all are to be henceforth worthless in the transportation of exports. Certainly such a proposition is not reasonable, to say the least. If, without antagonizing the principle of low rates on exports, we can formulate any plan which gives promise of saving to the seaboard cities that European trade which they have built up; if the railroad companies have allowed the existing discrimination to grow without taking any steps to secure to the seaboard its equal right to compete in exporting with interior points; then there is ground for complaint. A fair field for every city (including New York), and no favor to any, is good American doctrine. Such a platform is not asking for profits to middlemen at the expense of producers, as has been charged.

Is such a plan possible? Yes; and if not we must make one so. Perhaps the Commission may have some outlines in mind already. For myself, I put hopes upon some modification of the rebate method—I mean the charging of the domestic rate upon grain shipped to New York and the refunding of the difference if such grain is afterwards exported. I am aware of the difficulties involved in this system, which works well enough at Boston, where two roads do all the business, but whose defects would be brought at once to light if put in practice at the greater and more competitive port of New York; but railroad ingenuity has solved more complicated matters before, and I for one have great faith in our managers' ability. The Commission's decision on the Boston export case really covers this rebate plan at New York in principle. The Commission say (a) that export and domestic rates need not be the same; and (b) that rebates are lawful under these circumstances. Apply these successfully to other seaboard cities, and we can make low export rates without injuring seaboard traders. Chicago papers at first took up arms against the New York Exchange, but afterwards half joined it. In this they were wise, for the theory once established that no city has a right to a fair chance for trade, the next step would be an application of the doctrine to Chicago itself, in the exports of flour from Minneapolis or provisions from Kansas City. It is true that a rebate scheme would allow unscrupulous merchants and roads to receive and give drawbacks on shipments not exported. The "underbidding" amendments to the Inter-state law would help us here. The obstacle is great but not insurmountable.

If the Produce Exchange asks for justice, such justice as leaves the field free to all on equal terms, and demands nothing for itself which it does not gladly accord to others, then it must be admitted that such a position appeals strongly to that love of fairness which is so prominent a characteristic of our people. T. L. GREENE.

[Do we understand that the Produce Exchange does not care to go as far in the restriction of export rates as Judge Cooley is trying to? If so, we join hands with them; but we find it hard to believe that



WESTINGHOUSE BRAKE-GEAR FOR SIX WHEEL TRUCK.

such is the case. What Mr. Greene says is fair and sensible. He is right in thinking that the railroads ought not to be allowed to destroy or seriously interfere with the trade of New York. There is no doubt that reckless competition in export rates tends to have that effect. We should like to see it kept within moderate limits by some such system of rebates as is here suggested. But by no means every one is as moderate or as practical as he is. There are others who will not hear of any such differences at all, and who insist that home and export shipment should be placed on exactly the same level. We are sorry to see that the Inter-state Commerce Commission has abandoned the ground taken in the Boston rate case, and seems to be inclining toward the more extreme view. Its last official utterance seemed to imply it; and if a recently published interview with Judge Cooley was genuine, there can be no doubt at all on the subject. It was with these utterances in mind that we wrote the paragraph criticized. If the Commission and the Produce Exchange demand nothing more than is suggested by our correspondent, we shall be glad to know it; and in that case we shall make our apologies to all parties concerned. But we see very little reason to expect such a result.—EDITOR RAILROAD GAZETTE.

Westinghouse Brake Rigging for Six-wheel Truck.

The accompanying illustration shows the brake rigging used by the Westinghouse Brake Co. for applying the brakes to all the wheels of a six-wheel Pullman truck. The construction is obvious and does not need any particular explanation. One point, however, is worthy of notice. All compensation for wear of shoes is on the usual horizontal lever that is fulcrumed on the bottom of the car near the centre. This lever is not shown on the illustration but it will be readily understood that it is not necessary to get under the truck to provide for any adjustment due to the wear of the shoes. As it is difficult to do this, the brake gear has been arranged with this point particularly in view. It will be noted that there is no spring for the purpose of pushing the shoes from the wheels, this being accomplished by gravity, due to the proper hanging of the brake gear.

We understand that this brake arrangement has been thoroughly tried and is the result of continued experiments extending over four or five months, and the results show it to be entirely suitable for the purpose.

Some experiments were made with different lengths of shoes, and it was found that shoes 18 in. in length were much superior to those 14 in. in length in point of wear, and that the additional length more than proportionately increased the life of the shoes. The exact measure was shown

in two trips made by the same car over identically the same route—that is, from Pittsburgh to Jacksonville, Fla., and return. The shoes 14 in. long were nearly two-thirds worn out in the trip. With 18-in. shoes the wear did not amount to 10 per cent. In one case it was evident that the pressure per square inch approached the cutting or grinding action, while in the other it was reduced to a point where the abrasion was very slight.

The Cost of Earth Work.

A paper entitled "Rapid Railway Embankment Construction," by Isaac A. Smith, recounting the cost and speed of doing earth work by the shovel and two horse team, was printed in the March number of the *Journal of the Association of Engineering Societies*. Another one, entitled "A Railroad Culvert," giving the cost, no special attempt at speed having been made, of filling a trestle by the use of a steam shovel and train of cars, under the direction of E. A. Hill, Chief Engineer of the Indianapolis & Decatur Railroad, was printed in the last number of the *Railroad Gazette*. These papers may well have their results compared, though the speed and economy of Mr. Smith's work are phenomenal, while the results obtained by Mr. Hill, being a record of every day practice, are merely an example of good management, and the comparison is so far unfair.

The work described by Mr. Smith, Chief Engineer of the St. Louis Transfer Railway Co., in a paper read before the Engineers' Club of St. Louis, was making an embankment 40 ft. wide on top, about 10 ft. high and about one mile and a quarter long, containing 97,500 cubic yards, which between legal delays and the requirements of the charter had to be completed within 20 days from the time of commencement. Although there was some doubt as to the possibility of completing the work within the time, two borrow pits were secured, where the material was wholly silt, on Mississippi River bottom land, and the average haul was 1,300 ft. Two days were spent clearing the borrow pits of logs and willows and building a temporary road.

The work was then commenced and finished on the sixteenth day from the commencement, under the following organization: Sixty, 2-horse wagons were employed for each pit, which was wide enough to load 20 wagons at one time, and also give room to seven shovellers for each wagon. The wagon beds were of uniform size, which was determined by the pit foreman before the wagon was allowed to enter the pit, by measuring with a stick 8 ft. long, which had two notches cut in it, one 3 ft. 3 in., and the other 1 ft. 8 in. from the end. These wagons held about 1.6 cu. yds. each, and were required to haul 40 loads per day to the dump, or a travel of very nearly 20 miles per day, loaded and empty. Each gang of seven men loaded three wagons, 40 trips each, throughout the day, and each man shoveled 27.41 cu. yds. The silt was dry. The wagons, when loaded, went to the dump and were

unloaded by the dumpman. No team which had stopped for any reason on the dump was allowed to start on the soft ground until unloaded. All men and teams were numbered, and as each team left the dump the driver was given a ticket. He had to show 40 of these for a day's work. Each pit had a foreman, to preserve order and place the wagons. The men were not allowed to talk to each other, or to smoke or drink, and the teamsters were not allowed to leave their seat on the wagons. Water was brought to the teams, and ice-water to the men when they needed it. Although care was taken to keep an even surface in the borrow pits, teams occasionally got "stalled," and one span of horses to every 20 teams was employed to help those which could not start their loads. No plowing or picking was required.

The wages paid were: To pit foremen, \$2.50 per day; to teamsters, \$4.00 per day; shovellers and dumpmen, \$1.50 per day; and to ticket-boys, \$1.00.

All the material in the bank did not come from the two borrow pits, the working of which has just been described; grading contractors and cellar diggers delivered dirt on the dump in their own wagons. These were given tickets, which were redeemed at the rate of 10 cents each.

No contractor could be found who would give a satisfactory guarantee to complete the work within the required time, and the lowest bid received, without such guarantee, was 35 cents per cubic yard. The actual cost, under Mr. Smith's organization, was 18.58 cents per cubic yard. Apparently this is a case where haste did not make waste.

Mr. Hill's work was in a bank about 12 ft. high, with a steam shovel of the Otis type, loading one train of 12-ft. cars which were unloaded with a plow. Average haul, 4,000 ft. The cars held about 8 cu. yds. each, and on 2,612 car loads, or 21,000 cu. yds., the cost for labor, repairs and supplies was 7½ cts. per cu. yd. The average expense for loading only was 5 cents. The largest day's work was 124 cars and the average for summer and winter was 68 cars per day. The monthly pay roll was \$378.50, which did not include the engineer and fireman on the locomotive.

The Method of Comparing the Cost of Chilled and Steel-Tired Wheels.

Three weeks ago we published some portions of the report of the Massachusetts Commissioners on the Bradford accident. In that report was a brief study of the relative economy of chilled and steel-tired wheels, made by Prof. Geo. F. Swain of the Massachusetts Institute of Technology. That study was but a portion of an elaborate paper by Prof. Swain which now appears in the *Technology Quarterly*, and from which we reproduce here such extracts as will serve to show the method of comparison and some examples of its application. The method is thorough and simple enough to be applied by any one with a very moderate amount of mathematics, and the figures assumed

by Prof. Swain for mileage of different wheels, cost of turning down tires, re-tiring, etc., it is not necessary to discuss. They serve the purpose of illustration, while for exact comparison the actual figures must be obtained in any given case. The paper is as follows:

The engineer—no matter what branch of the profession he may follow—is frequently called upon to consider and decide upon the relative economy of different classes of structures, appliances or machines for accomplishing the same ends. Some of these may be much cheaper than others in first cost, but their life may be shorter, or the annual expense of maintaining them greater; and it not infrequently is a question of some complexity to determine properly which is, in the end, the most economical. * * * The object of this paper is to indicate what seems to the writer the proper method of viewing such questions, *supposing the necessary data to be at hand*, and to illustrate its application to the question of car wheels. It must not be supposed, however, that anything will replace a sound and far seeing judgment. A completely correct solution of any problem of this kind is complicated by a great variety of circumstances. The cost of materials of construction, of coal, of maintenance, is subject to variation; the rate of interest fluctuates, and the life of few structures or machines can be stated with absolute certainty. To the far-seeing mind, circumstances entirely aside from cost will sometimes, if not in the majority of cases, fix the class of structure to be adopted. * * *

This problem, in its most general form, may be considered to be this: A certain structure or machine costs A dollars, it requires the expenditure of B dollars for repairs at intervals of s years, it will last for n years, and when worn out it may be sold for D dollars. A second structure or machine for accomplishing the same object costs A_1 dollars, requires the expenditure of B_1 dollars for repairs every s_1 years, lasts for n_1 years, and is worth D_1 dollars when worn out. Which of these will be more economical, as a permanent thing, the rate of interest being r , payable semi-annually?

To answer this question we must compute the amount of present capital sufficient to provide permanently for each of these structures, and the one which requires the smaller capital will be the more economical. Or we are enabled to find, by the same method, what the cost A_1 of a (perhaps new) appliance must be, in order that it may be more economical than a similar appliance in use, under various suppositions as to the life, cost of maintenance, etc.

The present capital required for any structure will be made up of three parts.

- 1st. A , the cost of the structure.
- 2d. A sum which, put at interest at r per cent., will increase in s years, by the amount B . This sum may easily be shown to be

$$\frac{B}{\left(1 + \frac{r}{2}\right)^s - 1}$$

r being expressed as a proper fraction ($r = \frac{6}{100}$ if the rate is 6 per cent).

3d. A sum which, put at interest at r per cent. will amount in n years, to itself plus $(A - D)$; since at the expiration of the n years, the worn-out structure being sold for D dollars, there will result a sum sufficient to again expend A for a new structure, and have the original sum remaining, which in another n years will amount to sufficient to purchase a third structure, and so on indefinitely. This sum is

$$\frac{A - D}{\left(1 + \frac{r}{2}\right)^n - 1}$$

The total present capital involved in the use of any structure is therefore

$$C = A + \frac{B}{\left(1 + \frac{r}{2}\right)^s - 1} + \frac{A - D}{\left(1 + \frac{r}{2}\right)^n - 1}$$

Professor Swain gives a table of the values of the quantity

$$\frac{1}{\left(1 + \frac{r}{2}\right)^n - 1}$$

for different rates of interest and different values of n . From the table the coefficient of B and of $A - D$ in the above formula may be taken out. The table is calculated for each two years up to 30 years, and for each five years up to 75. We give it here only up to 10 years.

TABLE GIVING VALUES OF COEFFICIENT FOR DIFFERENT RATES OF INTEREST.

3 per cent.		4 per cent.		5 per cent.		6 per cent.	
n	x	n	x	n	x	n	x
0.5	66.67	0.5	50.00	0.5	40.00	0.5	33.33
1	33.112	1	24.752	1	19.762	1	16.420
2	16.287	2	12.136	2	9.634	2	7.968
3	10.706	3	7.924	3	6.381	3	5.152
4	7.905	4	5.824	4	4.523	4	3.748
5	6.23	5	4.506	5	3.570	5	2.908
6	5.111	6	3.728	6	2.900	6	2.348
7	4.314	7	3.130	7	2.421	7	1.951
8	3.717	8	2.682	8	2.064	8	1.654
9	3.254	9	2.335	9	1.767	9	1.424
10	2.883	10	2.058	10	1.566	10	1.240

As an example in the use of this table we will consider the economy of chilled iron as compared with steel-tired car wheels, under different suppositions as to life and first cost. This problem is a very simple one, yet in discussing it erroneous figures and conclusions are the rule rather than the exception.

One method, sometimes used by wheel manufacturers and

others in comparing these different kinds of wheels, may be illustrated as follows: Suppose that a chilled-iron wheel costs \$10 and a steel-tired wheel \$50, but that the latter will last as long as ten of the former. Then we have ten wheels at \$10, or \$100, as against one wheel at \$50—or “a saving of \$50 in favor of the steel-tired wheel.” Clearly, this method of comparison is entirely incorrect. * * *

A second method, very commonly used by engineers in other comparisons, is to compare the first cost plus the capitalized cost of maintenance. Thus, supposing that one structure costs \$100 and will last five years at an annual expense of \$5, then this annual expense at 5 per cent. is the interest on \$100, which, added to the first cost, gives a total of \$200. If, now, another structure costs \$60 and will also last five years at an annual cost of \$7, the sum obtained is \$200, as before, so that according to this method of calculation, the two structures would be equally economical. But it will be evident that in the first case we should be paying \$100 down and \$5 a year for five years, or, in all, \$125 in five years, while in the second case we should be paying \$60 down and \$7 a year for five years, or in all, \$95 in five years. The second structure is, therefore, in reality much more economical than the first, and the method of computation is shown to be fallacious. It is, in fact, only correct when the duration of each of the structures compared is infinite, as already remarked.

The problem becomes still more complicated when we come to consider the effect of the sum which can be obtained for the worn-out wheel; yet even in taking account of this, one or the other of the methods indicated above is generally used. * * *

The question is sometimes, though rarely, discussed correctly, although by a method somewhat different from that proposed in this paper, as follows: Suppose that a steel-tired wheel costs \$50, and requires the expenditure of \$2 every two years, until at the expiration of ten years it is worn out, and is sold as scrap for \$10. Find now the sum which \$50 would amount to in ten years, at the assumed or current rate of interest; also what \$2 would amount to in eight years, plus what a second \$2 would amount to in six years, a third in four, and a fourth in two years; from this total sum deduct the scrap value of the wheel, and the remainder will represent the total cost of that wheel, with interest; and this can be directly compared with the cost of another wheel, for the same length of time. This method is used by some railroads in studying the comparative economy of different kinds of wheels. It is, however, not so easy in its application as the one herein proposed.

For purposes of illustration, let us now start with some figures regarding the cost and mileage of chilled-iron wheels. These wheels cost from seven or eight up to thirteen or fourteen dollars each. They give a mileage which varies very greatly according to the quality of the wheel and the character of the service put upon it. Under passenger equipment it is claimed, on the one hand, that wheels of good quality will not give a mileage of over 30,000 miles; while, on the other hand, some claim that wheels of this kind have been known to run 40,000 miles. Under freight equipment the mileage should be somewhat greater than under passenger equipment, since the wheels are not so apt to be worn flat by sliding, caused by the application of the brakes, and since it is not so important that a wheel should be perfect. Again, the actual mileage of a wheel is not what is required in making a comparison of this sort—it is the *length of time* the wheels last, which will depend upon the average daily mileage of the cars. This, also, varies greatly according to the circumstances of the case, such as whether the wheels are used for local traffic, making frequent stops, or whether they are run on through express trains for long distances, etc.

Let us assume, now, two classes of chilled-iron wheels, viz:

- I. Cost \$10 ($= A$).
Value of scrap, \$5 ($= D$).
Average mileage, 30,000 miles, or say one year, at about eighty miles a day.
Cost of removing old wheel and fitting new one, \$1.
- II. Cost of wheel, \$12.50 ($= A$).
Value of scrap, \$6 ($= D$).
Mileage, 60,000 mileage, or say 2 years.
Cost of removing and fitting, \$1.

Now by the use of the table it will be found that the capital necessary to furnish forever one of these wheels is, at 4 per cent. interest:

For Class I., \$159.50.
For Class II., \$104.50.

Let us now compare these with several classes of steel-tired wheels, by finding how much could be paid for such steel-tired wheels to make them equally economical with the chilled-iron wheels; that is, using the same capital in both cases. We will consider the following four categories of steel-tired wheels:

- (a). A wheel which is not to be retired, but in which the wheel and tire are welded together, so that when the tire is worn out the wheel must be replaced. We suppose that the mileage of such a wheel is 240,000 miles, but that after each 60,000 miles the tire must be turned down and made true, at a cost of \$1, which is a very low figure. The worn-out wheel will be worth about \$10. We therefore have in our formula, $B = \$1$; $s = 2$; $D = \$10$; $n = 8$ —supposing 30,000 miles to be traveled in a year.
- (b). As a second class, take a wheel of the same kind, but which runs 120,000 miles to a turning, or 480,000 miles in all. In this case we have, $B = \$1$; $s = 4$; $D = \$10$; $n = 16$.
- (c). As a third class, take a wheel whose centre is indestructible, but whose tire is to be renewed at intervals.

Suppose it bears four turnings at 60,000 miles each, or 240,000 miles in all, equivalent to eight years.

Cost of turning, \$1 every 2 years.
Cost of re-tiring, \$30 every 8 years.

Here we have, $B = \$1$; $s = 2$; $D = 20$ (since we have already allowed \$1 every two years); $n = 8$.

(d). Finally, suppose a wheel to be re-tired; centre indestructible; 5 turnings at 90,000 miles, or three years' service for each turning.

Total mileage, 450,000 miles—15 years.
Cost of turning, \$1 every 3 years.
Cost of re-tiring, \$50 every 15 years.

The following table gives approximately the price which could be paid for steel-tired wheels of the four classes, to make them equally economical with the cast-iron wheels, interest being reckoned at 4 per cent.:

Class of steel-tired wheel.	Class of cast-iron wheel— I.	II.
a.....	\$47.00	\$32.00
b.....	77.00	51.00
c.....	69.00	13.00
d.....	90.00	36.00

A further study of this question will show very clearly that small differences in the assumed data will make very considerable differences in the results obtained. For instance, we have taken the cost of turning a steel-tired wheel at \$1. Probably in the majority of cases it costs more, and in many cases double or treble that amount. If we suppose, now, with wheels of class a, that the cost of turning is \$2.50 instead of \$1, we shall obtain, for the price which could be paid for them, \$42 and \$27, instead of \$47 and \$32 respectively. The results obtained by taking \$1 as the cost of turning are, of course, in favor of the steel-tired wheels, and from the table some general conclusions may be drawn.

In the first place, since the cost of steel-tired wheels is generally above \$50, it is clear that a cast-iron wheel of class 2, i. e., one which, costing \$12.50, would last for a period of two years, would be considerably more economical than any of the steel-tired wheels considered, excepting those of class b, of which the mileage is assumed to be 480,000. This average mileage, however, has not as yet been attained, the average upon one road which uses them extensively being about 270,000 miles. On the other hand, as already stated, while some excellent authorities claim that the mileage of good cast-iron wheels, under passenger traffic, will not exceed 30,000 miles on the average, other authorities state that it will run up to 50,000 or 60,000 miles.

It cannot, therefore, be stated absolutely that cast-iron wheels are cheaper than steel-tired wheels, or the reverse. Some kinds of cast-iron wheels may be cheaper than some kinds of steel-tired wheels, and the reverse is also true. But while the element of cost is one which should of course be considered, there are other and more important ones affecting the choice of a wheel, such as safety and convenience. Clearly, the difference in cost is not such as to override these questions.

A Double Accident.

Two disastrous derailments, within ten minutes of each other, and at the same place, caused by the undermining of bridges by high water, occurred near Kansas City, Mo., on May 23. While there were in this occurrence few or no marked elements of hazard or chance that are not found in train accidents every month, the combination is remarkable, and we therefore, as a striking illustration of the possibilities of danger which have constantly to be contended with on railroads, print the particulars as reported in a dispatch to the New York Times:

Five miles east of Kansas City is a creek 40 ft. wide and 20 ft. deep, which is crossed by the Wabash and the Hannibal & St. Joseph railroads. A little before 3 o'clock this morning an east-bound freight train of the Rock Island, which uses the Hannibal track between Kansas City and Cameron, approached this bridge. The water was running like a torrent, and the engineer and fireman had barely time to jump as the train dashed on the bridge. Both men were thrown into the creek, but escaped with slight injuries.

Five heavily-loaded freight cars then piled into the creek in a mess, splintering and smashing the cars and throwing their contents into the water and on the banks. The engine got over the bridge safely, but was pulled back by the tender and stands up on end far above the debris. T. Royston, a brakeman, was on top of one of the freight cars which went into the creek and was instantly killed, being mashed beyond recognition.

Brakeman Armstrong went out to flag the Hannibal freight, but mistook the tracks and walked on the wrong one or in some way was struck and killed by a Wabash freight. It was only about a minute (accounts differ) after the wrecking of the Rock Island train when the Wabash freight, composed of an engine and 12 cars, came thundering along. The wreck was not discovered by the engineer until it was too late to stop his train. He sounded the whistle, and the engineer, fireman and brakeman jumped from the train, the engineer being badly hurt. The Wabash bridge was parallel to that of the Hannibal and distant from it only about two feet. They were braced together and the breaking of the former destroyed the braces. Instead of this bridge breaking, it turned to one side, throwing the engine into the creek and piling 11 cars on top of it. The bodies of two tramps were found terribly cut and mangled.

The noise of the escaping steam from both engines and the possibility of an explosion prevented the train hands from attempting to rescue any one who might be in the wreck. After the turmoil had ceased faint groans were heard from the Wabash wreck. After working half an hour the men pulled out Ben Norris, a colored youth, who was pinned down by heavy beams with his face and head nearly submerged in the water, which had been dammed by the wreck, and now was beginning to run over it. Norris was a roustabout man. Nearly every bone in his body was broken, and he is not expected to live. One other brakeman was badly hurt. [Another body was found in the wreck three days after.]

NEW CONSTRUCTION AND SURVEYS—Continued.

NAME OF ROAD.	Track laid between Jan. 1 and May 1, 1888.			Under construction.			Surveyed and under survey.		
	From	To	Miles.	From	To	Miles.	From	To	Miles.
Louisville & Nashville	Flat Lick	Pineville, Ky	9	St. Joseph, Tenn.	Florence, Ala.	25	Clarksville, Tenn.	Dickson, Tenn.	30
Indiana, Alabama & Tex.				Iron City, Tenn.	Ironton, Tenn.	11½	Lawrenceburg	Lexington	22
Louisville Southern	Louisville, Ky	Harrodsburg	77	Harrodsburg	Danville, Ky	9	Versailles	Beattyville	70
Louisville, St. Louis & Tex.				Midway	Georgetown	10	Owensboro, Ky	Henderson	30
Lynchburg & Durham				West Point, Ky	Durham, N. C.	113	Lynchburg	Rustburg	43
Manitoba Central				Lynchburg, Va.	Intern'l boundary	71	Winnipeg	Portage La Prairie	65
Manitoba & Northwestern				Winnipeg	Prince Albert	310			
Midland of Indiana				Langenburg	Brown's Valley	10	Flambeau	Hurley, Wis.	48
Mill. Lake Shore & West				Ladoga, Ind.	Flambeau	27½			
Minn., Sault Ste. Marie & St. L.	Vadnais Park	St. Paul	5½	Rhineland, Wis.	near Willow Lake	100	Arkansas City, Ark.	Vidalia, La	150
Minnesota & Dakota				Fargo, Dak.	Hillsboro, Tex.	66*			
Mississippi Valley				Dallas, Tex.	Smithville, Tex.	36*			
Missouri, Kansas & Texas				Lockhart, Tex.	Sealy, Tex.	27*			
Missouri Pacific	Independence, Kan.	Denver, M. & A. RR.	6	Boggy Tank, Tex.					
	Malta Bend, Mo.	East line of Saline Co., Mo.	22	County line	Boonville, Mo.	17	Fort Smith, Ark.	Gurdon, Ark.	150
Monroe & New Orleans				Rob Roy	toward Raineyville	10			6
Montana Central	Great Falls	Sand Coulee	15	Helena, Mont.	Butte, Mont.	73	Various branches		30
Napanee, Tamworth & Q.	Marysville Junction	Marysville	5	Helena, Mont.	Red Mountain	15	Tamworth, Ont	Tweed, Ont	20
Narragansett Pier									
Nashville & Charleston				Narragansett P. R. I.	South Ferry	4½	Nashville, Tenn.	Walhalla, S. C.	340
Nashville & Florence	Iron City, Tenn.	Station 461	3½	Iron City, Tenn.	Florence, Ala.	33			
Nashville & Knoxville	Lebanon, Tenn.	Shop Springs	7	Shop Springs, Tenn.	Cookeville, Tenn.	7	Black River	Sabine River	128
Natchez, Red River & Texas				Gordonsville	Carthage, Tenn.	7	Newport, Ark.	Jonesboro	37
Newport, Jonesboro & St. L.							Groton, Conn.	New London, Conn.	5
New York, Prov. & Boston							Flat Top Coal Fields		
Norfolk & Western	Graham, Va.	Springville	7½	Springville	Norton, Va.	98½	W. Va.	Ironton, Ohio	200
Northern Pacific	End of track	Genesee, Idaho	15½				Calvin, Mont.	Butte, Mont.	25
Ogdensburg & L. Champlain							Cheney, Wash.	Columbia River	118
Ohio River							Chateaugay, N. Y.	Chateaugay Chasm	1
Paragould & Buf. Island				Paragould, Ark.	toward St. Francis R.	5	Ravenswood	Spencer, W. Va.	25
Pa., Poughkeepsie & Boston				Pough. Bridge	Montgomery, N. Y.	22	Silvernails	Liberty Corners	8
Peoria Terminal				Peoria, Ill.		3*			74
Philadelphia, W. & Balti- more	Shellpot Br. (Wilton)	Newcastle, Del.	5	Pomona, Cal.	Elsinore, Cal.	42			
Pomona & Elsinore	Wilmington, Del.		6						
Pitts., Shenango & L. Erie	Greenville, Pa.	Amasa, Pa.	3½	Knoxville, Tenn.	Cumberland Gap	63	Black River	Pembroke, Ont.	14
Powells Valley							Prescott, Ariz.	Phoenix, Ariz.	110
Pontiac Pacific Junc.	Coulonge, Ont.	Black River	10				Quincy, Ill.	La Grange	45
Prescott & Arizona									
Quincy & Beardstown				South Amboy, N. J.	Brund Brook, N. J.	18			
Raritan River				No. Carolina line	Martinsville, Va.	14			
Roanoke & Southern				White House, N. J.	New Germantown	4			
Rockaway Valley						5			
Rome & Decatur	Rome, Ga.	toward Attalla, Ala.	45						
Richmond & Danville— Western N. C.	Jarretts, N. C.	Red Marble Gap, N. C.	3	Red Marble Gap	Murphy, N. C.	27			
St. Augustine & Palatka	Palatka, Fla.	connection with St. J. & H. R. R.	1½	Winston, N. C.	Wilkesboro, N. C.	75			
St. Augustine & S. Beach									
St. Louis, Ark. & Tex.				Matanzas Ave. Junc., Fla.	South Beach	3	Malden, Mo.	St. Louis, Mo.	95
St. Ignace, S. S. M. & No.							St. Ignace, Mich.	M. St. P. & S. S. M. Ry.	25
St. Louis, A. & T. H.									
St. Louis & Central Ill.	Alton, Ill.		1	Parker City, Ill.	Brooklyn, Ill.	40	Bates, Ill.	Springfield	13
St. Paul, Minneap. & M.— Duluth, W. & S. F.				Alton, Ill.	Newberne	13			
San Diego & Elsinore				Wilmar, Minn.	Sioux Falls, Dak.	150	San Diego, Cal.	Elsinore, Cal.	60
St. Paul, Alex., Jennings, Lake A. & Gulf							Alexandria, La.	Vermillion, La.	130
S. Ste. Marie & Southwestern	Fairchild, Wis.	Osseo	15				Rhineland, Wis.	Almar, Wis.	
Seattle, Lake S. & East- ern	Woodinville, W. T.	Gilman, W. T.	20	Spokane Falls	westward	45	Summit	end Spoke's D. (W. T.)	200
Sheffield & Birmingham	Delmar, Ala.	Jasper	36	Earle	Summit of Cascades	40	Snohomish, W. T.	Skagit River	40
Somerseset									
Southern Pacific	Napa Junction	Santa Rosa	37	North Anson, Me.	Bingham, Me.	16½			
Stockton & Tulare	Shingle Springs	Placerville	12						
Staten Island R. T.	Fresno	Alila	65	Alila	Poso	20	South Ave.	Gen. R. R. of N. J.	2½
Suburban R. T. Co.	Clifton, S. I., N. Y.	Richmond Ave.	1½	New York City		½	S. & C. R. R.	Edenton	16
Suffolk & Carolina	Ryland, N. C.	Montrose Landing	4				S. & C. R. R.	Winston, N. C.	14
Spokane Falls & Nor.							Spokane Falls, W. T.	Little Dalles	118
Suwannee River							Macon, Ga.	Palat. & Interlachen	281
Tabor & Northern				Macon, Ga.	Valdosta, Ga.	150	near Sycamore	Thomasville, Ga.	72
Texas & Pacific	Strawn, Tex.	Palo Pinto Mines	4				Tabor, Ia.	Hillsdale, Ia.	8½
Tilton & Belmont									
Toledo, A. A. & N. Mich.				Saginaw, Mich	Durand, Mich.	52	Tilton, N. H.	Belmont, N. H.	4
Toledo, Sag. & Mack				Rives, Tenn.	Troy	5	Cadillac, Mich.	Frankfort	
Troy & Tiptonville				Tuscaloosa	(North) Warrior River	7	Troy, Tenn.	Tiptonville, Tenn.	25
Tuscaloosa Northern							Warrior River	Alta	33
Union Pacific— Lincoln & Colorado				Colby, Kan.	West line Thomas Co.	19			
Salida, L. & Western				Waldo, Kan.	Plainville, Kan.	30	Prospect, N. Y.	Noblesboro, N. Y.	20
Utica, Adirondack & Sar. Valley (Ohio)				Mineral Point, O.	Huff's Run mines	2	Vincennes, Ind.	Owensboro, Ky.	70
Vincennes, O. C. & Owensb.							Waco, Tex	Cameron, Tex.	53
Waco & Brazos									
Western of Florida	Belmore, Fla.	westward	1½						
West Side & Mendocino	Willows, Cal.	westward	17						
W. Va. Cent. & Pittsburgh				Thomas, W. Va.	Leadsville, W. Va.	24	Millville	Shickshinny	75
Wilkesbarre & Western									23
Wilmington Sea Coast	Wilmington, N. C.	The Beach	9½				Sumter, S. C.	Augusta, Ga.	100
Wilmington & Weldon	Scotland Neck, N. C.	southward	5				Zanesville, O.	Mineral City	72½
Zanesville & Ohio River	Pee Dee, S. C.	Little Rock, S. C.	18	Sumter, S. C.	Santee River	10			
	Waterford, Mich.	Lowell	12	Little Rock	Plainview	18			
Totals			1,310	Lowell	Harman	10			8,116

* Work suspended.

New Construction.

We present to-day in a form to be conveniently used a summary of the information of new track laid, road under construction, and surveys made for further extensions, up to May 1 of this year. This information has all been received directly from officers of the various railroads, and does not include anything from unofficial sources. Therefore, the aggregate mileage is not quite as large as it might be made to appear, but the information is as authentic as it is possible to get. All of it has already appeared in these columns under the "Old and New" heading. Replies are still coming in, and a supplementary table will be published later with a recapitulation by states.

Fifty-First Meeting of the American Institute of Mining Engineers.

HELD MAY 15 TO 21, 1888, AT BIRMINGHAM, ALABAMA.
For the chronicler of this meeting to attempt competition with the flowery writers of the South, and especially those of the Birmingham press, seems so hopeless that your correspondent thinks it best to write a simple narrative, for the Birmingham boom affects the local writers, and their productions abound in poetry and rhetorical figures, as for example the following description of a visit to a mine: "Red and white Bengal fires were burned, and the cavernous depths for a few seconds were bathed in a light such as might

have blazed in Dante's 'Inferno.' The miners looked like imps in the flare," etc.

However, the welcome accorded the Institute by Col. E. T. Taliaferro (who don't know how to pronounce his own name, for he calls it Tolliver) was hearty and bright. He laid great stress on the abilities of the members to decide the future of Birmingham, and expressed the greatest willingness to submit to their inspection the furnaces, rolling mills, mines, etc. He wound up with the remark: "The God of Iron had planted Jacob's staff here in Birmingham, and invited all the world to gather round it." I am a little mixed about this "Jacob's staff," and never knew Vulcan owned one, notwithstanding his slight lameness. But Vulcan's in-

vation to the world has been pretty freely accepted. Birmingham, called the Magic City, was founded in 1871, and the first lot was sold in May of that year. In December, 1871, the village contained about 700 people. In 1873 it had grown to 2,000 inhabitants, when the financial crisis paralyzed the city for a time, and stock in the land company was sold for 17 cents on a dollar, and, to use the flowers of rhetoric again; "the star of its destiny seemed to have forever set in the midnight of desolation and failure." Fortunately for Birmingham it was not that kind of a star, and following the usual celestial rules, having "set in the midnight, etc.," it promptly proceeded to rise again in spite of the noble youth who penned the foregoing lines, although, after such a eulogy, any star possessed of proper self-respect would have stayed "set." So it came about that in 1879 things began to look up, and the Alice furnace was built, and in 1880, the rolling mill. From this time to the present there has been a continuous advance. Everything is done on a tremendous scale. As an evidence there is in process of erection and nearly completed a hotel costing about \$1,500,000, and capable of holding nearly 1,000 guests. It stands on a high point overlooking the city and commands attention at once. It is safe to say that hotel would not be out of place in the most fashionable part of New York City, so attractive and ornate is its appearance. The water-works are arranged to supply the wants of 100,000 people, and at present nearly one-half that number are in the city and its immediate surroundings. The suburbs are quite beautiful, and there are various "dummy" roads extending in every direction, till one wonders if they can possibly pay. The inhabitants assert that these roads do pay; but the writer found out that most of them have not paid a dividend, so is a little skeptical on this point. Birmingham has also an ice factory, and the ice furnished is good, clear and properly cool; at least it seemed to have that effect on the juleps. We were advised not to drink the water on account of its limestone characteristics. It was said all the water drinkers had died prematurely, and as we wanted to live and write this article we stuck to juleps. The town is quiet and orderly, and the writer did not see one drunken man while there. It was stated that 170 trains daily run into the railroad station, which is a fine building, well arranged and under careful and sensible superintendence.

The sessions of the Institute were held in the commodious opera house. After President Foster had made a suitable response to the address of welcome, and our silver-tongued Secretary had added a few well-chosen words, the meeting was declared open and business commenced.

Among other papers read was one on the Henderson steel process and how it was done, or rather how it was not, for the description given, which dealt with such terms as "patented air," seemed very much like Mr. Keely's description of that motor which never "motes." It was also stated it had been the aim of the inventor to find iron poor enough to demonstrate the value of his process and that he had experienced difficulty in obtaining it. The Institute certainly saw samples during their visit which ought to have satisfied most any searcher after such a grade. The statements of the chemist were sharply discussed, and the general impression was that this process was what is known as a "laboratory process." In other words, the result was reached after much expense, and the analysis given, while correct, afforded no positive promise of any commercial success. It may be noted the Henderson Co. have lately formed a new concern, to be known as The Henderson Steel Co., with \$1,000,000 capital, and "expects to build a 100-ton steel plant, a rolling mill, and an iron foundry with two or more 5-ton hammers."

That afternoon, we visited various furnaces and stopped at Redding, where we were shown a vein of iron ore from 10 to 20 ft. thick. The formation is the Clinton, and it has been mined to about 300 ft. from the surface. About 1,000 tons per day are named as the output of mines No. 1 and No. 2. In a paper read at this meeting it was stated regarding this ore that for 100 ft. it is soft red ore, with little or no lime carbonate, and averaging 50 to 55 p. c. of iron, and for the next 100 ft. the carbonate of lime increases rapidly and the proportions are about 25 to 35 p. c. of iron and 40 to 45 p. c. of carbonate of lime. The ore is known as hard red ore. In furnace practice it was not unusual to take half of each with little or no additional limestone. The ore is shipped 11 miles at an expense of 75 c. per ton, 25 c. of this being freight charges. Wages vary from \$1 to \$1.25 per day, the workmen being negroes.

The next day was spent in visiting furnaces of various kinds and the mines and coke ovens of the Pratt Coal and Coke Co. The vein of coal here is but 4 ft. thick and is being successfully worked. The coke seemed quite firm and of a fair quality.

From here the party went to Ensley for lunch. This was served in the club-house of the Ensley Land Co. This organization controls a large amount of land in the vicinity of the furnaces here erected, and which has been laid out in avenues and streets. Their plan, as stated, is to offer inducements to manufacturers, and it is ingenious. A sale is to be made of the lots, and the proceeds to be loaned to any reputable manufacturer who will agree to employ as workmen none but land owners. The sale was to have occurred before our visit but had been postponed until a later date.

Several pretty houses have been built and the place is connected by dummy line with Birmingham.

After lunch the party went to Bessemer, which is but a short distance. This place has a history, not very unusual in America, but impossible in any other country. April 12, 1887, there was not a house there. In ten months the population was about 4,000; seven lines of railroad were graded to the city, and the number of buildings erected was 350. Among them are a three-story block 100 ft. long, of brick

and iron, some 8 or 10 smaller brick blocks, a handsome bank building of pressed brick, trimmed with terra cotta, cut stone and stained glass; the Charleston block (a 4-story building of pressed brick, marble and iron, costing \$125,000; the Grand Hotel, costing \$50,000, and the Palmetto block, 300 ft. front by 100 ft. deep. There are also two other hotels of smaller dimensions. Five churches of sufficiently varied creeds provide the religious instruction for this community. Something like \$3,000,000 is invested in manufacturing interests, and the pay roll amounts to \$100,000 per month. The people have also constructed a fine system of water-works, and declare the place to be the healthiest known. A 28-column daily newspaper prospers here, and furnished an outlet to the interviewed member of the Institute.

Two furnaces are building in Bessemer, and a large rolling mill capable of handling 125 tons per day. The people here look for 15,000 inhabitants within the year, and this is not a fancy picture either, for the rolling mill will alone employ 600 men, containing, as it does, 24 puddling furnaces, with overhead railroads, and the ground inside the mill has been raised 8 ft. to facilitate loading on the cars. A number of coke ovens are being located near this mill, and the near proximity of the coal and iron points to economy in iron and steel manufacture.

The next day the session was resumed, and a number of papers, mostly on iron and steel and the methods of working ores of various kinds, were read and discussed. Some of the party went to see the Gate City Rolling Mill and the Trussville Furnace that afternoon, others visited some new coke ovens under the escort of officers of the Tennessee Coal, Iron & Railroad Co. An effort has been made to utilize machinery so far as possible in charging the ovens and in drawing the coke. In the new ovens a steam ram is employed. The party had an opportunity to see its workings, and the entire charge was shoved out and drenched with water carried over the top of a sheet iron lined car, and poured on the glowing coke by means of a sprinkler. When the coke was sufficiently cooled it was then pushed off this car, and allowed to fall into a large gondola car on the railroad track below, the fall breaking up the coke into fragments suitable for use. The apparatus was not in complete working order when exhibited, but the results promised to be satisfactory, and the coke for a 24-hour charge (as stated) was certainly a fine product. It is true the railroad car caught fire several times, and perhaps the railroad company may object to such use of its stock, but this is a minor matter, and railroad companies are monopolists and fair prey. The visitors were not disposed to be over-critical, especially in a first test, and were much pleased with the operations. The coke was clean, bright and hard, and will no doubt prove a satisfactory product.

The usual dinner occurred that evening, and the Secretary, as usual, bore off the palm for oratory and wit.

The next day a special train conveyed the party to the Cahaba Coal Co.'s mines at Blockton. This company is a mark of the signal ability and enterprise of its President, Mr. T. H. Aldrich, and proved to be the finest mine and plant shown to the Institute. Their property embraces some 36,000 acres of coal land, well timbered and in desirable shape for mining. They have six mines in operation and are working two seams, one of 6 ft. and one of from 3 ft. to 3½ ft. The whole outfit, including the means for ventilation, for pumping and for handling the coal, show thorough study of the needs of the case and of the most economic method of handling the coal. The capacity of the mines opened is 2,500 tons daily, and the company employs about 750 men. It owns four locomotives, three of which are Baldwin Moguls. There are in construction, nearly completed, 300 coke ovens of bee-hive pattern, and in their construction Mr. Aldrich has studied the latest and most improved forms. The output of these ovens is contracted for at the present time, and from the samples shown us there is but little doubt it will prove the finest coke made south of Pittsburgh. It is very firm and will sustain the furnace charge. Its analysis is as follows:

Volatile hydro-carbon	4.508
Fixed carbon	87.607
Sulphur745
Ash	7.140
	100.00

This was made by Alfred Gaither, chemist.

Mr. Aldrich announced at the meeting that he did not believe there was any difficulty in making first class coke from the Alabama coal, provided sufficient care was taken in the selection of the material and in the manipulation, and the results seem to prove the correctness of his statement. In addition to other merits the Cahaba Co. proved themselves excellent hosts, and ample justice was done to their bountiful lunch.

The next day many of the party went to the celebrated Anniston Inn to spend Sunday, and the Woodstock Iron Co.'s works and the large pipe works were inspected. The meeting closed on Monday with an excursion on the Anniston & Atlantic narrow gauge road and a ball at the Anniston Inn that evening.

It would be impossible to give accurate figures as to the cost of iron in this region, but from the best information it is probably from \$10 to \$12 per ton, although as low as \$9 was claimed. The coal is from \$1.12½ per ton upwards. That this is one of the most promising sections of the United States may be considered beyond question, and while it has been perhaps over "boomed," there is but little doubt in the mind of the writer that the country will very soon grow up to its present reputation. The resources are so great and lie so near at hand, and the enterprise is so remarkable, that business must speedily settle down into its legitimate channels. When this occurs the growth will be steady and uniform. The money for development has been forthcoming, and is being for the most part put to its legitimate use. There may

be some crashes where inflation has occurred, but they will serve, like the thunder, to simply clear the sky for the succeeding bright sunshine. W.

Continuous Steam Heating in Massachusetts.

Mr. C. F. Choate (President Old Colony); George A. Torrey (Attorney Fitchburg), and Richard Olney (Attorney Boston & Maine), have printed a communication, in which they severely criticize the position of the Massachusetts Railroad Commissioners on the subject of heating passenger cars by steam from the locomotive, and particularly the views of the Chairman, Mr. Crocker, as recently published by a Boston paper. The concluding paragraphs of Mr. Crocker's letter are as follows:

"With some of these improved heaters, there is a good chance that in an accident they will not occasion a conflagration. But when it is left by the Legislature to this board to decide what method of heating shall be used, the board does not feel justified in approving those which are nearly safe, when a practical system has been devised which, as far as danger from fire is concerned, is absolutely safe. The board believes that the people of this state are entitled to absolute safety, if it can be secured by any such simple method as the adoption of locomotive steam heating. The expenditure will be considerable but not excessive. If the approval of individual heaters should be continued, the companies, in the event of a disaster, would be able to say, 'We are not responsible for this terrible calamity, for this heart-rending torture. The fire was set by legalized heating apparatus kept in the cars with the approval of the board of railroad commissioners, to whose discretion the Legislature saw fit to trust this most important question.'

"The board believes that Massachusetts should continue, as it now is, as a leader in this movement. Locomotive steam heating is surely coming. It is farther advanced in Massachusetts to-day than anywhere else. Its general adoption in Massachusetts will add to the hard earned reputation of the state as a leader in progressive humanity."

Messrs. Choate, Torrey and Olney have replied as follows: * * * The real question before the Legislature is this: The law has condemned the use of common stoves for the heating of passenger cars. It provides that any other mode of heating may be adopted which is approved by the Railroad Commissioners. The Railroad Commissioners, having already approved the Baker heaters and the Johnson heaters as proper apparatus for the warming of cars, are now of the opinion that the true mode of heating is by steam from the locomotive. They have accordingly notified the Legislature that unless it does something to the contrary all their existing approvals of modes of heating will be withdrawn from and after Oct. 1, 1889. Unless the legislature interferes, therefore, the practical effect of the attitude of the Railroad Commissioners is that every railroad in the Commonwealth must at once proceed to alter over its equipment so as to heat its cars by steam from the locomotive. The necessary alterations of rolling stock cannot be made without an expense to each of the principal railroads running out of Boston of at least \$100,000. The point is, has the method of heating cars by steam from the locomotive been shown to be a practicable as well as the best method by such tests and by such actual experiments that the proposed action of the Railroad Commissioners is justified?

Now, the railroads do not object to the Railroad Commissioners' proposed action merely on the ground of expense. If the mode of heating recommended by the Commissioners is the best, it ought to be adopted, even if a considerable increase of expenditure from the railroads is required. The real objection of the railroads is that the superiority of the Commissioners' method if not yet established, and that the railroads ought not to be required to substitute it for the existing reasonably safe and effective methods until its superiority is demonstrated not merely in theory, but as a matter of actual working.

The evidence in favor of the superiority of the mode of heating recommended by the Commissioners is:

1. The opinion of the Railroad Commissioners, founded on the opinion of Professor Gaetano Lanza. Professor Lanza is a professor in the Institute of Technology, and is doubtless a scientific man of eminent ability. But it is not pretended that he has any qualification as a railroad expert, or that, as matter of fact, he has any practical knowledge of or experience with the operation of railroads.

2. The experience of the Boston, Revere Beach & Lynn, which has adopted a system of steam heating from the locomotive peculiar to itself and not in use on any other railroad in the country, and not, as is believed, practicable for any other railroad in the country. At all events, it is plain that a mode of heating which may be efficient and practicable on a road ten or a dozen miles long may be wholly impracticable when applied to roads 50 or 100 miles long.

3. The experience of the Connecticut River and the Boston & Albany. Just what the experience of each of these companies has been was not in evidence before the railroad committee. If it has been a favorable one, the General Managers or their Master Mechanics ought to have been produced and the exact facts shown. So far as the Connecticut River is concerned, no data is furnished except the unsupported assertion of the Railroad Commissioners. So far as the Boston & Albany is concerned, the general impression is that its experience during the last winter has made it extremely doubtful whether it is possible to rely for the warming of cars upon steam from the locomotive. It was said at the hearing before the railroad committee that complaints from passengers on the Boston & Albany of the temperature of the cars during the past winter were very loud and very frequent. It is notorious, too, that there was considerable suffering during the blizzard among the passengers on the Boston & Albany trains that were stalled between stations. And it may probably be safely asserted that while the Boston & Albany is endeavoring to make the system of heating recommended by the Railroad Commissioners a success, and will persevere until complete success or failure is assured, it would abandon the system altogether and at once if it were not for the expectation that continued experiments would result in greatly improving the particular method it has now in use.

The result is that the opinion of the Railroad Commissioners, which they propose shall be carried into practical execution at such a very great cost to the railroads of the Commonwealth, is really based upon nothing but the theoretical opinion of a professor of the Institute of Technology and the unfinished experiments of two railroads of the Commonwealth.

On the other hand, that the proposed action of the Railroad Commissioners would be premature—that the method of heating cars by steam from the locomotive has not yet been so perfected that it can be safely adopted and relied upon,—was shown to the railroad committee by a large amount of evidence of the most convincing character.

1. The Railroad Commissioners themselves, in their special report to the Legislature, say that the difficulties have not all been surmounted—that there is trouble from the leakage of steam and from the freezing of traps and the imperfect action of reducing valves on the engine.

2. The evidence of practical men before the Railroad Com-

mittee was that the use of steam for heating cars taken from the locomotive appreciably diminished its motive power.

3. The same witnesses testified that no efficient means had yet been devised of regulating the heat of steam from the locomotive—that there was great complaint among travelers either that the cars were entirely cold or were intolerably hot.

4. One of the prominent officials of the Grand Trunk testified that he had been in the beginning a believer in the mode of heating cars by steam from the locomotive; that that road had made experiments during the last winter for the purpose of testing the system and in the hope of making it a success, but that he felt bound to say that so far it had proved a failure. The road was still experimenting with the system, and would continue to, but the result of his experience was that he should not consider it prudent to dispatch a winter train for any long distance with no other mode of heating it than by steam from the locomotive. On his road the experiments with the system were continued, but the Baker and Johnson heaters were also kept in the cars.

5. The Master Mechanic of the Providence testified that that road had, at the suggestion of the Railroad Commissioners, equipped more than 100 cars with the apparatus necessary for warming them by steam from the locomotive. The road had faithfully experimented with the system and with all the latest and most improved devices for making it successful. In his judgment the system as at present in use was a nuisance, and should be continued only in the hope of ultimate improvement.

6. The practical men before the Railroad Committee also testified that great difficulty must be experienced in heating cars left or picked up at junctions or way stations. It was testified that in all such cases permanent heating plant would have to be established at different points, the cost of which would of course be additional to the cost of altering over the cars and engines and fitting them with steam heating apparatus.

Thus at the hearing before the Railroad Committee no railroad man practically versed in the operation of railroads testified in support of the recommendation made by the commissioners. The testimony of the presidents, managers and master mechanics of railroads, so far as they appeared, was directly against any such recommendation. Still another difficulty was suggested to the Railroad Commissioners at the hearing, which they were unable to dispose of. That difficulty was that a mode of heating prescribed by the law of Massachusetts could be applicable only to cars running between points in Massachusetts—the regulation of the mode of heating cars engaged in inter-state commerce being exclusively with Congress. What the railroads were to do with cars running between points in different states if Massachusetts prescribed one mode of heating them, New Hampshire another and Maine another, was a matter upon which the Railroad Commissioners could give no information or advice. Indeed they could not be expected to, for in their report of this very year is the statement that it is at least doubtful whether any state regulation can be constitutional which prescribes any form of safety device for cars engaged in inter-state commerce. * * *

The above considerations are sufficient to show the improvidence of the Railroad Commissioners' proposed action. It may be—it is to be hoped that it will be—hereafter demonstrated by the test of practical use that passenger cars can be suitably warmed by steam from the locomotive under all circumstances and without reducing the motive power necessary to move the train. But until that is done nothing could be more unwise—nothing could more seriously prejudice the position of the Board of Railroad Commissioners itself, than for it to require the railroads to be at the risk and expense of substituting for approved safety devices others having in their favor little else than the unverified opinions of theorists.

CHARLES F. CHOATE,
GEORGE A. TORREY,
RICHARD OLNEY.

Vertical Boring Machine.

We illustrate herewith a new vertical boring machine, furnished with two speeds, making it suitable for heavy and light work.

The frame is in one piece, the casting being cored to give it strength. The machine has a wide base, making it self-supporting, no top or side bracing being required.

The large steel mandrel works up and down through a sleeve pulley, which forms the journal, so that the mandrel revolves, but does not come in contact with the journal box. The treadle which operates the mandrel is counterweighted and the depth of boring is regulated by an adjustable stop attached to the mandrel.

The table raises and lowers on planed ways operated by a hand wheel, screw and gears; it can be beveled, and the face angled to do any kind of boring.

The idle pulleys are placed at the proper angle to make the belts to run true and even on the mandrel pulley; they run on studs connected to an adjustable box; this box, with pulleys attached, slides in planed ways, thus providing sufficient movement to take up the belt when changing from one speed to another.

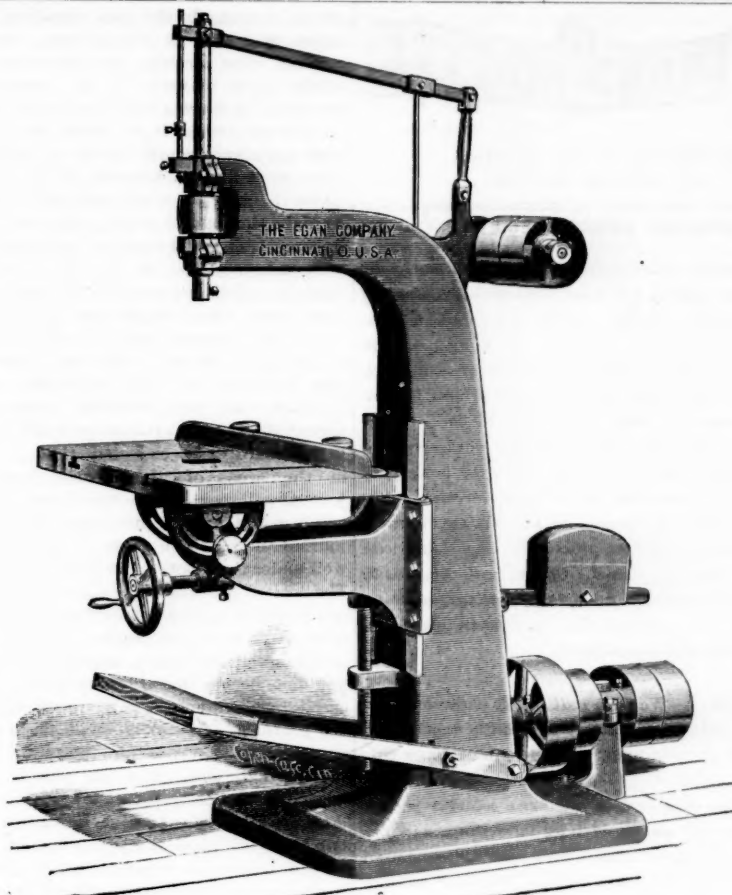
The machine will bore to a depth of 12 in., and has a space of 18 in. between the boring bit and inside of column, so that it has a great range for boring either large or small holes.

Any further information may be obtained of the makers The Egan Company, Cincinnati, Ohio.

Gold's Blizzard Heater.

The accompanying illustration represents a stove designed by Mr. Edward E. Gold to supplement any system of continuous steam heating, and provide a means of heating the cars when the locomotive is detached.

The heater consists of a fire-brick pot and a telescopic chimney, formed of No. 12 to No. 18 gauge steel. When not in use the chimney shuts up inside the firepot, and the whole apparatus can be placed in a box measuring 17 in. x 17 in. x 10½ in. high. This box can be shoved underneath the seat, and thus occupy no valuable space in the car. Coal and kindling wood can be kept in another similar box, and thus a ready means of heating a car in an emergency is provided. It is evident from the simple nature of the apparatus that it is not liable to get out of order, and that it cannot deteriorate with time. Where cars are fitted with the Gold storage system, such an emergency stove would probably be rarely wanted, and in any event it is im-

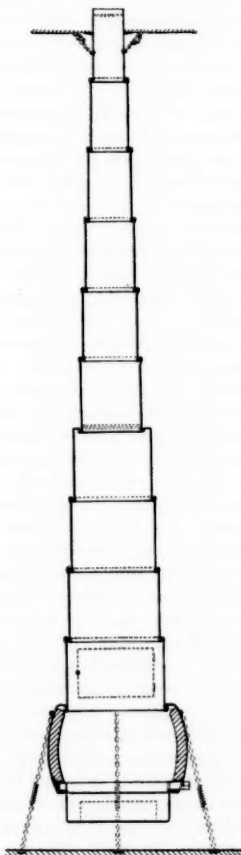


VERTICAL BORING MACHINE.

Made by the EGAN COMPANY, Cincinnati, Ohio.

portant that the provision for independent heating in emergencies should be simple, easily understood and always available at short notice. Mr. Gold's device appears to fulfill all these conditions, and is moreover cheap.

When not in use, the firepot rests on the floor of the car.



Gold's Blizzard Heater.

When extended the top section of the chimney is hooked by chains to the roof, and the firepot is suspended clear of the floor. The sections of the chimney are kept tight and extended by means of the springs and chains attached to the firepot.

TECHNICAL.

The Poughkeepsie Bridge.

It is now said that the Poughkeepsie bridge will be completed by Sept. 1. It might have been done by July 1 so far as the

engineers and contractors are concerned, but it is found that the connecting railroads will not be ready to use it before the end of the year.

Locomotives for New South Wales.

The *Ironmonger* (London) of May 19 says: "No decision has been arrived at yet by the Government (New South Wales) on the vexed question of the locomotives, but an offer has been made by a Mr. Leaby, who has carried out some contracts with success, to do the whole work at a small advance on the Government limit of £3,000 per engine. The trade generally regard the offer with indifference, and do not seem to think it seriously meant."

The Eads Ship Railway.

Col. Andrews, in speaking against the Tehuantepec scheme, said: "The first meeting of the new company, which was chartered in New Jersey, will be held at Newark, June 8. The name of the company will be the Atlantic & Pacific Ship Railway Construction Co., and its first move will be to purchase the right, title and franchises of the Eads Concession Co. This done, work on the project will be commenced at once and pushed to a speedy completion. About \$40,000,000 will be necessary to carry on the scheme, and this sum can be raised without any difficulty."

A Steel-tired Cast-iron Wheel.

The Peckham Car Wheel Co. is offering a new wheel with cast-iron centre and steel tire, the tire secured by retaining rings. The centre is one piece, having double plates with radial ribs cast between the outer and inner plates. The tire is made of open hearth or crucible steel, and shrunk on. The retaining rings are so fitted that they tighten as the tire cools, preventing its turning on the centre should it become loose. The rings are bolted to the centre by riveted bolts.

Bush Bolts.

The New York, New Haven & Hartford is so satisfied with the holding powers of the Bush interlocking track bolts, as manifested in the recent derailment of a passenger train at the South Norwalk drawbridge, that 3,250 sets have been ordered for the Cos Cob bridge.

New Grain Door.

The Cleveland, Columbus, Cincinnati & Indianapolis is testing a new grain door, the invention of a clerk on that road. It is said to be convenient and substantial, and cannot easily be detached from the car.

Hard Coal Burners on the Erie.

"A new era in Erie" is the euphonious phrase in which the passenger department of the New York, Lake Erie & Western announces that passengers need give themselves no further concern about the annoyances of soft coal smoke, as for the future all passenger trains arriving and departing from Jersey City will be hauled by engines burning hard coal. "This step on the part of the Erie places it in the front rank of the railroads of the country," and none of the picturesque scenery of the line has been sacrificed in making the improvement.

Electric Motors on Street Railroads.

After an examination of the various electric railroads, the East Side Street Railway Co., of Brockton, Mass., has decided to adopt the Thomson-Houston system.

Mr. E. P. Shaw, of Newburyport, will use the same system on his Salisbury Beach railroad.

The Naumkeag Street Railway Co. has completed arrangements with the Thomson-Houston Co. for the introduction and trial of their system of motors on the Willows Branch of the road, and it is expected that the road will be equipped and in running condition before the close of the present season. Should the system prove successful, the extension to Ipswich will probably be carried out.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The Omaha Demurrage Bureau, after eight months existence, continues to show the same satisfactory results that characterized it at first (as described in the *Railroad Gazette* Jan. 27 and Feb. 24 last); that is, it keeps the number of standing cars at reasonably low figures, and is conducted without troublesome friction. Railroad officers will do well to keep themselves posted concerning such an important experiment as this. On a certain day last week the Union Pacific had on its side tracks in Omaha 400 loaded cars ready for unloading by consignees, and of this number only one had been there over 48 hours. Most superintendents would be extremely glad to show a record like that at yards doing a fortieth part of the business indicated in this statement, and if they heard of its being possible at stations handling a tenth of Omaha's business would think themselves dreaming.

The placing of nearly \$25,000,000 of Reading 4s at 87½ or thereabouts, and of \$12,000,000 first preference incomes, will give the officials a chance to pursue their plan of reorganization under most favorable conditions. It shows that they have the confidence of the financial world; and this will give them a decided advantage over their predecessors in making their business pay. Financial status makes more difference with a coal road than with any other. In the first place the contrast between good and bad years is more marked. Then a coal road is always doing a great deal of general commercial business which requires a large amount of ready cash. With a poor road and a poor year, these two things make great trouble. The bad showing makes it difficult to get the cash; the difficulty of getting the cash makes it necessary to sell coal at a sacrifice, this in turn makes the bad showing worse, and so on indefinitely. The present financial operations relieve Reading from this danger, and give it a chance to work on its merits. Incidentally, the result can hardly fail to benefit the other coal roads also. Forced sales on the part of a single company injure the others also; in like manner, anything which relieves one road from the necessity of such sales is a relief to the others.

Several subjects for discussion as to the adoption of standards will probably be brought to the front at the approaching convention of the Master Car-Builders' Association. The most important is possibly the adoption of a standard axle for 60,000-lb. cars. While it is easy to determine what increase should be made in the diameter of the axle so as to give the required in-

crease in strength, the open questions present themselves in regard to the journal. Should it be increased considerably in size and proportioned solely with a view to its running cool and giving good service and long wear under a 60,000-lb. car or should it be made shorter and smaller than experience would dictate in order that it may when worn be used in the M. C. B. journal box under 40,000-lb. cars? It would certainly appear preferable to make the journal so large that wear will be almost imperceptible and heating so rare that few axles will have to be removed on account of cut journals. To make a journal confessedly too small in order that it may, after doing insufficient service, run under a lighter car, appears hardly good policy. The M. C. B. journal is already somewhat small for the heavy cars now built to carry 40,000 lbs., and the future 60,000-lb. car will probably when loaded impose almost 50 per cent. greater pressure on the journals. It can hardly be expected that a small increase in the area of the bearing surface of the journal will meet this considerable increase of load, and it would appear preferable to both enlarge the journal and make the journal sufficiently large to run well under the heavier cars now fast coming into use. The use of continuous brakes, tight couplers, better permanent way, heavier engines and a better system of signals has already caused a considerable increase in the speed of freight trains, and this increase will doubtless become more general every year. Increased speed means increased tendency to heat and cut the journals. The increase in speed and load both demand an increase in the bearing surface of the journal, and hence it would appear to be advisable to boldly incur the extra expense of the larger axle, and the greater inconvenience of having two standard axles and two standard journal boxes. It can hardly be expected that a journal box and journal which was designed for a 40,000-lb. car can be made to run satisfactorily with 50 per cent. increase of load unless the modifications are radical.

Ventilation of Passenger Cars.

A state railroad commissioner has asked why, while saying so much about heating we do not say something also about ventilating passenger cars. The problem of heating cars by steam from the locomotive is new, and is yet in the experimental stage. New devices, new experiences and new deductions from those experiences are coming up all the while. In all parts of the country, too, laws or public opinion, or both, are pressing for a prompt change in the methods of heating, and it is most important for railroad officers to decide what system or appliance they will adopt. We try, therefore, to keep our readers informed as to the best that is said and done for the solution of the problem.

With ventilation the case is quite different. There is no pressure made for immediate improvement. No new principles are brought to light, and no new devices or experiments presented. To write on the subject, therefore, would be to try to arouse interest where little is felt, and to show the desirability of change where practice is pretty well settled. The man who undertakes to improve present practice in ventilation finds at the outset that there are three classes of people who must be convinced that that practice requires improvement, either in the means now provided for changing the air, or in the way of using those means. These are, the people who travel, the officers who design and pay for cars, and the brakemen or porters who work the ventilators; and the accumulated inertia of these three classes makes a resistance that perhaps will only be overcome by the action of the state commissioner himself through his legislature. Really, the first obstacle in the way of better ventilation seems to be with the public, rather than with the railroad officers; and the efforts of operating officers to make the most of the means provided for ventilation are baffled by the action of the passengers. In any given carload of people there are sure to be enough individuals who dread fresh air to prevent the effective use of any but the most insidious means of ventilation. Except in absolutely hot weather they will insist on having closed any openings provided for the admission of air, and the clear-story sashes by which it is exhausted. But for these individuals the arrangement of almost all the modern cars of intelligent builders would give a tolerable circulation of fresh air. They are largely responsible for the perverted notions of the average train hand as to what is a wholesome supply of fresh air or a comfortable temperature. The ordinary day coaches of the Pennsylvania, for example, are supplied with warmed fresh air by the well-known Spear heater, the air being taken in by

a hood, passed around the stove inside of a jacket, and discharged under the seats. There are end transoms and swinging sashes in the clear-story. Last November the General Manager issued a circular for the guidance of the trainmen, explaining by the aid of diagrams the functions of the various parts of the system and urging the importance of keeping open the transoms and those ventilating sashes which opened toward the rear. Yet it has been extremely difficult for trainmen to follow the instructions because of the ubiquitous passenger who is on the lookout for a draft, and in cool weather it is not unusual to see every ventilator in even those cars tightly closed. The case is worse where it is designed to take the supply of fresh air from a transom, or sashes, in the forward end of the car. There the passenger can see and require the closing of the aperture by which air should enter, as well as those by which it should leave the car; and the brakeman with uncorrupted nostrils or a high sense of duty may for a while keep up a struggle to do what he considers right, but he is pretty sure to give up in the end. Unless he be a sanitary engineer with at least three diplomas, he has not the courage of his convictions.

So the best contrived schemes of ventilation and the most enlightened orders lose half of their effect. It is not surprising, therefore, that but few railroad officers should take a very active interest in the subject of ventilation. Of course they ought to make sure that passengers have fresh air of a moderate temperature, whether they want it or not; but even a railroad man is governed by the ordinary motives of human kind, and does that which is the most pressing or most expedient.

The introduction of systems of continuous train heating will modify the problem of ventilation and open a new field for ingenuity. It will do away with the present systems of passing the incoming air through a heating chamber, and it will also do away with the advantage now got from the independent heater in exhausting the vitiated air. A heater in a car ventilates somewhat by constantly drawing off from near the floor more or less air. Even the slight circulation thus induced will be lacking in a car heated by a continuous circulating system, either of steam or hot water. "Every schoolboy knows" that the air of a tight room heated by steam pipes soon gets excessively disagreeable, and that in this particular even the "air-tight" stove is pleasanter than a steam radiator. Moreover, in a car supplied with a long system of hot steam pipes it is probable that bad odors will often arise from the organic particles constantly falling on them. If, then, the ventilation of cars is not satisfactory now, it is likely to be even less so when the "deadly car stove" goes.

The designer who takes up the matter now under the new conditions will find some fundamental facts pretty well established by the most recent experience. It is evident, for example, that the arrangements for securing circulation of air should be, as far as possible, beyond the control of passengers, at least so long as the obstreperous minority rules and the complacent majority submits. But this will in turn require trainmen of judgment and the use of thermometers in the cars. If brakemen are to ventilate without interference, their acts, like a railroad commissioner's, must command approval because just. It is tolerably evident, also, that it is impracticable to introduce fresh air in considerable volume by means of end transoms or sashes, for it will fall in a cold shower at some part of the car. It goes without saying that it will not answer to admit cold air in large streams along the floor. But evidently it will not answer to trust to opening doors at stations and to the small streams of air entering at various unavoidable crevices. Some special provision must be made for taking it in in adequate volume. This is particularly true of sleeping cars and of well built cars generally, running on trains which make infrequent stops.

There remain two possible methods. The incoming stream of air may be broken up and diffused uniformly through the car, discharging, perhaps, in very small streams behind or under the heating pipes. Or it may be taken into a chamber provided with a coil, and then warmed before it is let into the body of the car. Colonel Mann's well-known "nose" is arranged on the latter plan, a heater being used in the chamber instead of the coil of pipe. It is generally understood that this apparatus does its work satisfactorily, and we know of no reason why it is not more used except the cost and the prevailing belief that the public would not appreciate pure air so much as inlaid and polished panels, crushed strawberry plush upholstery and vestibules with plate-glass sides. But

in the absence of rock ballast it is plain that ventilation is only half accomplished unless the incoming air is washed. No dry screen has yet been invented that will let in air and keep out dust. Col. Mann's ice chamber is a delightful luxury in summer and is well worth its cost; but if cost be an obstacle, the wet excelsior without the low temperature would probably be a decided improvement over the present method of catching the black dust on cambric handkerchiefs. And if the American traveling public is willing to pay for the luxuries in velvet, mahogany and gold that are provided for it on every hand, it certainly should, in consistency, be willing to pay something for undefiled air.

We have not dwelt on the sanitary importance of better ventilation. To most of those who travel it is apparent enough, and no argument would enlighten the minority who persist in having ventilators closed and suffer from headaches and various symptoms of partial asphyxia without knowing why. The state commissioner who suggested these remarks ventured the statement that more passengers are killed by bad air than are burned by fires set by stoves or heaters in wrecked cars. Very likely this is true, but it is one of those things which one may believe without being able to prove it. Unfortunately for those who survive, the victims of bad air die singly and unnoticed, like the tramps and other trespassers on the track, and "public opinion" takes no note of them.

Continuous Steam Heating.

The recommendations of the Massachusetts Railroad Commissioners as to the adoption of steam heating on passenger trains meet with opposition from some of the principal roads in that state, and their arguments against the immediate and obligatory adoption of continuous steam heating are stated very clearly and forcibly in a letter written on behalf of the Old Colony and other Massachusetts roads and printed in another column.

The position taken by Mr. Choate and his friends appears, however, to be weak on one point. The foundation of their argument is that all the systems of steam heating hitherto tried have shown practical defects in every day working. Is there anything new in this? On the contrary, we all know that every successful mechanical appliance now in use had, in early life, a struggle for existence. Did Watts' first steam engine or Stephenson's first locomotive work perfectly? We all remember Edison's hard fight to produce an incandescent light, and the whole history of invention shows that no improvement is effected until repeated failures have pointed out the right road. To argue, therefore, that a new thing should be abandoned because it is not perfect, is as absurd as to argue that because a child has the measles or the whooping cough, it will never grow up to be a healthy man.

The defects which are always manifest in a new mechanical appliance may, however, be broadly divided into two categories: defects, generally of detail, that can be remedied; and defects, generally of principle, that cannot be remedied. In which class can the defects found in all systems of steam-heating be placed? If continuous steam heating had shown a serious inherent defect of principle it might be well to abandon all further efforts to render it successful and extend its use. If, for instance, it was clearly shown that the amount of steam required for heating was 50 per cent. of that needed for hauling the train, it might be at once conceded that this was an insuperable objection. But as a matter of fact the testimony of roads that have used steam heating for some time on an extensive scale goes to show that as regards cost of fuel, steam heating is of distinct pecuniary benefit. Mr. Payson Tucker, the General Manager of the Maine Central, states that the extra amount of coal burnt in the locomotives costs considerably less than the coal formerly burnt in stoves. Mr. Hain, of the Manhattan, endorses this view, and considers, moreover, that the increased consumption of fuel burnt on the locomotive is very small and not worth considering, and that stoves cost more for repairs and attention, etc., than steam-heating apparatus. Thus those who have had most experience with steam-heating find it not only more cleanly and convenient and giving a more even distribution of heat, but distinctly economical both in fuel and repairs. As regards comfort to the passengers, there can be no two opinions that steam applied near the feet is infinitely preferable to the irregular heat of a stove which scorches the face and leaves the lower extremities cold, although this advantage is not peculiar to continuous systems. The principle of continuous steam-heating, therefore, appears to be correct, and the defects are in details, and will be remedied by a little longer experience.

Even Mr. Choate and his associates admit that there is a strong possibility that steam-heating will be ultimately successful, and it will be generally conceded that the faults shown are minor imperfections and can be easily remedied. This process of improvement is being vigorously carried out in many different quarters, and though the experience of the past winter has hardly yet borne fruit, the next season will doubtless see a considerable number of improvements in the details which have proved inconvenient or defective in service. On the Manhattan, for instance, the couplings used to give trouble from excessive leakage enveloping the car platforms in clouds of steam. The adoption of a suitable coupling, has entirely cured the evil on the Third Avenue line. Hose often burst through engineers carrying an excess of pressure, but the addition of a small pressure gauge on the engine, showing the pressure in the heating-pipe, has warned the runner against excessive pressure, and only about twelve hose failed during the entire winter. Thus a few simple improvements have in the course of time immensely improved the working of the system on the Manhattan.

Many of the systems running last winter were hurriedly designed and were fitted up by inexperienced men, but all appear to have attained at least a certain measure of success, and many methods of continuous heating are reported to have given great satisfaction. It is significant that those roads which have used steam heating most extensively are satisfied with the results and would not go back to stoves. These roads are generally short, but if the principle of continuous steam heating answers well on the Manhattan, Staten Island, and Boston, Revere Beach & Lynn, it has evidently no insuperable disadvantages and few serious defects of detail. And further, if it is successful on the Manhattan, where a train runs for hours with very brief stoppages even at the termini, it should do equally well between Boston and Fall River, a distance traversed in less time than a trip from Harlem to South Ferry and return, which is made without a single stoppage exceeding two minutes duration. In fact, the average Manhattan train runs continuously, with very brief stoppages, for a greater number of hours than any train on any line in Massachusetts. And in many respects the difficulties of steam heating are more considerable on the shorter line. The couplings have to be made and unmade more frequently, as the engines are changed more frequently, and should a hose blow off, it can be replaced at Taunton or any important stopping place without delaying the train seriously if at all, but a stoppage of five or ten minutes at Fourteenth street would bring scores of trains to a standstill and disorganize the service for an hour afterwards. The doors are also opened far more frequently, letting in a volume of cold air, which promotes ventilation, but lowers the temperature of the car.

The New York Central & Hudson River has had considerable experience the last winter with continuous heating, and it is not many weeks ago that we quoted Mr. Toucey's opinion that the most certain and uniform heating of either a moving or stalled train can be done with steam from the engine, and that with proper management even an auxiliary or emergency apparatus is unnecessary. This was after the trying ordeal of the blizzard. More recently we gave the experience of the Portland & Ogdensburg during the past winter. This road runs through a cold region, and its trains have frequently been exposed to a temperature of 20° to 35° below zero. Yet the Superintendent states that there has never been the slightest difficulty in keeping all the cars thoroughly heated. It would be easy to multiply evidence of this sort from the Intercolonial, the Maine Central, and other roads which have successfully used continuous systems in most trying winter climates, but it hardly seems necessary.

The main difficulties of steam heating, the provision of a tight coupling, an efficient circulation, simple and non-freezing appliances or traps to get rid of condensed water, and means of regulating the supply of steam so as to maintain an even temperature in the car exist equally on long or short journey trains. If these difficulties have been practically overcome by a few years experience on one or two roads, why should the railroads of Massachusetts not be equally successful? Certainly the Commissioners give them ample time, as they have till the autumn of 1889 to complete their arrangements.

Iron and Steel Production and Prices.

The annual statistical report of the American Iron and Steel Association, giving comparative statistics of the iron trade for the last two years, and some reviews of the iron

industry in foreign countries, has lately appeared. The statistics given are important in themselves, and they suggest a comparison of production and prices for several years.

The production of pig-iron in the United States for 1887 was 6,417,148 gross tons (or 7,187,206 net), against 5,683,329 gross tons in 1886, an increase of about 13 per cent. Of the year's output about 60 per cent. was made by bituminous coal, mostly coke; 26 per cent. by coke and anthracite, 6 per cent. by anthracite alone, and 7 per cent. by charcoal. Twenty-two states and one territory made pig iron in 1887; California, which made 1,562 tons in 1886, not producing any last year. The Southern States, including Maryland, but excluding Missouri, made 829,854 gross tons, an advance of less than 7 per cent. on the output of 1886, but an increase of 134 per cent. over the make of 1880. There were on Jan. 1, 17 coke and 2 charcoal furnaces building in Northern Alabama and Tennessee, which with the 14 coke and 10 charcoal furnaces already built will bring the daily capacity of that region up to about 4,000 net tons, and it is expected that all of them will be ready for blast by July 1 next. There seems no reason, except a lack of demand for the product, why this region should not be producing at the rate of 1,000,000 tons by the end of this year.

The production of pig iron in gross tons in the United States and the United Kingdom for the past 10 years, with the percentage of the joint make produced in this country, is given below, with the average price of No. 1 anthracite at Philadelphia:

	Production in the United States.	Production in Great Britain.	Percentage made in the United States.	Price.
1878.....	2,301,215	6,300,000	26.9	\$17.63
1879.....	2,741,853	6,009,434	31.3	21.50
1880.....	3,835,191	7,721,833	33.2	28.50
1881.....	4,144,254	8,377,346	33.1	25.13
1882.....	4,623,323	8,403,287	35.3	25.75
1883.....	4,595,510	8,490,244	35.1	22.38
1884.....	4,097,808	7,528,961	35.2	19.88
1885.....	4,044,526	7,250,057	35.8	18.09
1886.....	5,683,329	6,870,065	45.3	18.75
1887.....	6,417,148	7,441,927	46.3	21.00

During the three years 1861 and 1863 our relative production, varying from 14.7 to 15.7 per cent., was probably lower than it had been for any time during the preceding 100 years. Since that our percentage of production has increased regularly and satisfactorily with the exception of two slight depressions, one in 1871 and the other in 1876.

Our increase in positive and relative production seems to have been accompanied by a marked decrease in the fluctuations in prices, destroying to a great extent the speculative feature of the market. In 1872, when our percentage of the joint production of pig-iron was only 27.1, the monthly average prices varied from \$37 to \$53.88, or through \$16.88 on a production of 2,548,713 tons, and a railroad construction of 5,878 miles. In 1880, the next boom year, in which we made 33.2 per cent. of the joint production, the monthly average prices varied from \$23 to \$40, or through \$17, on a production for the year of 3,835,191 tons and the construction of 6,886 miles. Last year, with a production of 6,417,148 tons, equal to 46.3 per cent. of the joint production, and a railroad construction of between 12,500 and 13,000 miles, the variation in the monthly prices was only \$1, or between \$20.50 and \$21.50. Any consideration of the possible effect of increased production at different centres, in eliminating sharp fluctuations in prices, should not neglect the rapid advance of the German iron production, which has increased from 2,226,587 metric tons in 1879 to 3,907,364 in 1887, making her an exporting instead of an importing nation.

The production of Bessemer and Clapp-Griffiths steel was 2,936,033 gross tons, a gain of 29 per cent. on the production of 1886. Pneumatic steel was made in 11 states last year, against 9 states in 1886, the new states being Virginia and Indiana. Pennsylvania still maintains a lead over the united production of all the other states, having made 53 per cent. of all the ingots produced in 1887, against 59 per cent. in 1886 and 65 per cent. in 1885. Illinois made 26 per cent. in 1887, 21 per cent. in 1886, and 22 per cent. in 1885.

Eight new Bessemer and three new Clapp-Griffiths plants were completed in 1887, and at the close of the year three Bessemer works were in the course of erection. The total number of completed Bessemer steel works in this country at the close of the year was 43, with 89 converters, of which works eight were Clapp-Griffiths.

The production of steel rails has been for 1887, 2,049,638 gross tons; for 1886, 1,526,410, and for 1885, 959,471 tons, showing an increase since 1885 of nearly 114 per cent. The relative production of Pennsylvania has fallen from 68 per cent. in 1885 to 53 per cent. in 1887. Illinois has increased from 28 per cent. in 1885 to nearly 32 per cent. in 1887, and the rest of the country from 3 per cent. to 15. As stated in a late number of the *Railroad Gazette*, Chicago and Joliet exceed Allegheny County and Johnstown in the production of both ingots and rails.

The production of ingots and rails in the United States and the United Kingdom, with the average price for the year in this country is as below, in gross tons:

	United States. Ingots. 1 = 1,000	Rails. 1 = 1,000	Great Britain. Ingots. 1 = 1,000	Rails. 1 = 1,000	American price.
1878.....	654	491	808	634	\$42.09
1879.....	829	611	835	519	48.25
1880.....	1,074	852	1,044	740	67.50
1881.....	1,374	1,188	1,442	1,024	61.13
1882.....	1,515	1,284	1,674	1,236	48.50
1883.....	1,477	1,149	1,553	1,097	37.75
1884.....	1,376	967	1,300	785	30.75
1885.....	1,519	959	1,304	707	28.50
1886.....	2,269	1,562	1,571	730	31.50
1887.....	2,936	2,050	2,064	1,022	37.12

In examining our increasing production and the course of

prices we find that in 1872 we made 83,991 tons of steel rails and 808,866 tons of iron rails, importing 124,810 tons of steel rails and 340,236 tons of iron rails. That is, we produced about 66 per cent. of our probable consumption of 1,357,893 tons of rails. The range of monthly average prices for steel rails for that year was from \$104 to \$120.75, a variation of \$16.75, and for iron rails from \$71.33 to \$90.50, or through \$19.13. In 1880 we made 852,196 tons of steel and 440,859 tons of iron rails, importing 141,259 tons of steel and 118,267 tons of iron rails, so we produced over 83 per cent. of the 1,552,581 tons we consumed, and the variation in monthly prices of steel rails was from \$58 to \$85, or \$27, and from \$45 to \$68, or \$23 for iron rails. In 1887 our production of steel rails was 2,049,638 tons, and we imported only 137,589 tons, having made nearly 94 per cent. of our consumption, and the range of average monthly prices was between \$32.50 and \$39.50, or \$7 in all.

It might be noted here that in 1885 the lowest known price of steel rails was \$25.50, and in 1887 the highest reported was \$41.50, or a total difference in extreme prices of \$16 as against \$27 on the monthly averages in 1880.

The Bessemer steel made in this country and not used in rails is returned by Mr. Swank as 534,210 gross tons, against 423,121 tons in 1886, though the total quantity of steel rolled in this country, excluding rails and including the product of foreign blooms, was 805,496 gross tons.

The production of open-hearth steel was 322,064 gross tons, an increase of 47 per cent. on the production of 1886. In Great Britain the production of open-hearth steel for 1887 was 591,104 gross tons, showing an increase of 286,954 tons, an increase of 41 per cent. The principal causes of England's greater product of open-hearth steel are probably the development given to the industry, first, by the English government orders for guns and armor of that material, with the consequent orders from other governments; and second, its increasing use in ship building, the tonnage of steel ships built in England having exceeded the tonnage of iron ships in 1886. The orders of our government, with the increasing use of steel for our lake marine, will probably account for a good part of the 47 per cent. increase in our production.

Last year's production of iron and steel in the two countries, with the percentages made in the United States, is given below:

	United States.	Great Britain.	Percentage made in U. S.
Pig iron.....	6,417,148	7,411,927	46.3
Bessemer ingots.....	2,336,043	2,064,403	58.7
Steel rails.....	2,049,638	1,021,847	66.9
Open-hearth steel.....	322,069	981,104	24.7
Crucible steel.....	75,376	100,000	43.0
Other steel.....	5,593
Total steel made.....	3,339,071	3,145,507	51.5

Notwithstanding the comparatively small product of open-hearth steel, the growth of our steel industry as a whole presents a subject for national congratulation. Our first Bessemer steel rails, 2,277 t. ns. were made in 1867. In 1868 we made but 7,589 tons of ingots, and our total production of steel for that year was less than 27,000 tons. Open-hearth steel was first made here in 1869, and to-day we are the principal producers of steel in the world.

Our exports of iron and steel, chiefly finished products, were valued at \$16,235,922, less than any year excepting 1886, since 1880. Fifty-five locomotives were exported, against 50 in 1886. The value of agricultural implements exported was nearly 2½ million dollars.

Annual Reports.

Atchison, Topeka & Santa Fe.—The general results are as follows:

Main System (Atchison, Topeka & Santa Fe and Southern Kansas.)

	1887.	1886.
Mileage at close of year.....	3,016	2,526
Average miles operated.....	2,622	2,420
Gross earnings, freight.....	\$12,248,343	\$11,100,967
passenger.....	5,136,651	4,026,004
Total including miscellaneous.....	18,461,326	15,984,307
Operating expenses and tax-s.....	10,408,454	8,613,911
Net earnings.....	\$8,052,911	\$7,370,395

After paying \$3,229,781 of interest and \$4,474,725 of dividends, this leaves only about \$76,000; but other sources of income increase the surplus for the main line for the year to \$1,026,322. The subsidiary companies show a net deficit of \$354,407, giving a net result of operations for the year of \$671,915. The land department profits a trifle more than balance the sinking fund charges, so that the nominal surplus is a little greater than this. As compared with last year, the dividend payments show an increase of \$736,000, the net results of operation a decrease of \$347,000, and the nominal surplus for the year a decrease of \$1,185,000; the last results owing to diminished land sales.

The increased earnings were due to changes in the volume of business, the average rate per ton-mile having fallen from 1.615 cts. in 1886 to 1.347 in 1887—more than a quarter of a cent. Statistics of operations are not full enough to enable us to follow this change into all its details, but we note a great increase in train expenses, about half of the change in operating expense being due to this cause. In fact, the most unfavorable point about the report is the small change in some other items of operating expense, notably the charges for maintenance of way. These have increased only \$111,000, or less than 6 per cent., while operating expenses, as a whole, have increased over 20 per cent. It looks as though an effort had been made to keep the former down by arbitrary means.

The aggregate mileage controlled is enormous. It may be summarized as follows:

	Miles.
Atchison system.....	2,081
Southern Kansas system.....	935
Sonora system.....	350
Chicago, Santa Fe & California.....	498
Chicago, Kansas & Western.....	903
Gulf, Colorado & Santa Fe.....	1,022
Other lines wholly controlled.....	552
	6,341

To which may be added more than a thousand miles more, which are held in joint ownership or control with other companies. Changes in capital account are as follows:

	1887.	1886.
Stock.....	\$80,076,300	\$9,969,550
Bonds.....	48,813,000	40,191,000
Contingent liabilities (for subsidiary roads).....	14,007,000	12,284,000
Other accounts and debts.....	15,352,169	11,071,753
Cancelled bond account.....	3,002,000	2,679,000
Surplus.....	8,538,408	8,127,141

The actual liabilities are greater than this, since the aggregate bonded indebtedness of all lines owned or controlled amounts to \$120,798,000. The average capitalization of the system on this basis is a little under \$31,000 a mile.

Kansas City, Clinton & Springfield.—This report illustrates some of the disadvantages to which a small railroad system is subject. Depending as it does upon the business of one locality, the failure of the crops in that locality means a deficit in the year's operations. The gross earnings for 1887 were \$271,674; the operating expenses, \$162,218; the interest charges \$168,194, leaving a net deficit of nearly \$69,000. And yet this property was organized quite recently by men who understood the conditions of western railroading, and who seem to be managing it for what it is worth. But property like this is subject to local disturbances which cannot be well foreseen. A large consolidated system, like the Atchison or St. Louis & San Francisco, acts as a mutual insurance company for adjusting such local profits or losses on different parts of its line, and makes their efforts appear much less serious.

The authorities of New South Wales, where all the railroads in the colony are owned by the Government, are greatly troubled by steamboat competition on the Murray River. The people on the banks of the river induced the government to build a railroad to take out their produce, and also to expend £200,000 in dredging the Murray. The steamboats then cut under the railroad, which put its freight rate down so as for a short time to take all the traffic, but the steamboats have more than met that cut, leaving the road nothing but the passenger traffic, which does not pay. As the roads were built to develop the country, it seems hard to the government that they should be called on to operate them at a loss, and it is proposed to put a river toll on the steamers that shall be heavy enough to restore the traffic to the government road; but this plan is open to the charge that the consequent increase in transportation rates would deprive the inhabitants of the Bourke district of the natural advantage of living on a water course, arresting the development due to cheap transportation, and would sink the £200,000 expended for dredging. On the other hand it may be claimed that all other districts in New South Wales should have as cheap transportation as the Bourke District; but this might involve not only the payment of interest by the imposition of direct taxes, but a part of the operating expenses as well. The instance presents a curious study of the complications which may beset Government control of railroads where water courses afford opportunities for competition.

"Yowling about Burlington Mattresses" is the official report of a recent conference of general passenger agents at San Francisco. Whether or not east bound overland passengers in the emigrant sleepers should be furnished with a nice striped mattress with corded edges and pompons on the corners or be compelled to put up with the meagre accommodations that the renowned Marjory Daw confined herself to (or, even worse, to lie on bare boards), seems to have caused intense distractions. Cases in which a single straw, weighing perhaps ¼ oz., has caused derailment of a camel train, are proverbial; what the effect will be on the important interests involved in transcontinental passenger rates when a whole bagful of straws are wrangling in the balance can only be conjectured. At last accounts the weight of opinion seemed to favor about \$7 differential in passenger rates by the lines that could not furnish a 75 cent mattress for third class passengers' comfort. Evidently there is a wide field for speculators in straw on the Pacific Coast.

It has been urged that the use of compressed gas for lighting cars is attended with the danger of the gas exploding in the event of a collision. The imaginary nature of this danger was shown by the recent accident on the Philadelphia & Reading, where an escape of compressed gas from a leaky hose simply burnt for a few moments without any explosion. Experience in Germany has been of a similar nature, and a recent collision near Birkenhead, England, between two trains lit with compressed gas was unaccompanied by any explosion. At the time of the collision between the Hoylake and Mersey Tunnel trains, the gas in the latter was alight. The gas cylinders of the smashed coaches were taken from the debris and tested to a pressure of 150 lbs. per sq. in., and they were found to be entirely uninjured beyond a few severe dents. The gas fittings of the remaining portion of both trains had not suffered in the least

through the collision, and, with the exception of those in the smashed cars, not a single lamp glass was broken in either train.

It has been recently stated that the Mexican Railway is laying a great number of steel ties. On the other hand the Pennsylvania, which has been trying experimental steel and iron ties for eight years or more has lately ordered the last of them taken out of the track. This order of course does not include the one mile of London & Northwestern ties lately put in with English double head rail. This experiment was instituted for other purposes than to try the metal ties, which are merely incidental. It is quite apparent that little attention will be paid by the officials of our railroads to the matter of metal ties so long as wooden ones are so plentiful and cheap as they still are. One chief engineer tells us that he has a printed postal card answer to send to the numerous persons who write to offer him ties.

The Minneapolis branch of the Railroad Department of the Young Men's Christian Association appears to be in a flourishing condition, the membership numbering 366, while 33 new members joined during the month and the attendance at the rooms was 1,888 during the month of April. It is proposed to erect handsome buildings on Tenth street and Mary place. The Association publish a monthly paper, the *Bulletin Board*, at Minneapolis, and another, the *Headlight*, at Detroit.

The Ohio River Bridge at Cairo.*

Since the acquisition of its Southern lines, the Illinois Central system has seriously felt the break in its line which occurs at Cairo, on the Ohio River, and to remedy this a bridge over that river has for some years been considered a necessity.

A number of years ago J. M. Healey, Division Engineer of that portion of the road, made a triangulation survey at Cairo, to determine the distance between the head of the transfer incline at Cairo and a similar point in Kentucky. The distance was found to be 4,097 ft.

Borings made in 1881 show that nothing but a sand or gravel foundation can be had at or near Cairo. Fine and coarse sand, and gravel of the same nature, as well as sand and gravel mixed, exist in strata or beds of from 4 to 20 ft. in thickness. Beds of quicksand occur until a depth of 50 ft. is reached; lower than that, the sand and gravel for 120 ft. is free from it. Sand or gravel, if kept intact, makes a good foundation; and this fact probably secured the location of the new bridge at North Cairo, about one mile up the river from the transfer incline already mentioned.

The land between the Ohio and Mississippi rivers, for some 10 miles or more from their junction, is low, flat, bottom land, and is overflowed each winter and spring during the high water in the Ohio and Mississippi rivers. At the southernmost extremity of these low lands, at the junction of the rivers named, is located the city of Cairo. Cairo is protected from high water for some two miles on the east by what is known as the Ohio Levee; on the southwest and west by the Mississippi Levee, which is about three miles long; on the northwest by the Cross Levee, which is about one-half mile in length; and on the north by one-half mile of the Illinois Central embankment. The Illinois Central Railroad approaches Cairo from the north on a tangent, which for six miles is level, at a height of 54 ft. above low water mark, and connects with the North Levee or Illinois Central embankment, already mentioned, at its junction with the Cross Levee. The track at this point curves to the east through a quarter circle, and strikes a short tangent, which lies nearly east and west. From this tangent, the road curves to the south through nearly another quadrant, and passes down on the Ohio Levee to the passenger depot, some two miles distant. About parallel with and just south of this east and west tangent, and extending easterly across the river, is the location of the new bridge.

In 1886 a bill came before Congress to authorize the construction of a bridge over the Ohio River at or near Cairo, Ill. It was shown that the Illinois Central transferred by boat in 1884 at Cairo 61,723 loaded freight cars and 8,000 passenger cars, and that, while the tonnage of Ohio and Mississippi River craft touching at Cairo had decreased nearly 500,000 tons in the four years previous to 1886, the railroad tonnage crossing the river at that point had increased over 200,000 tons during the same time. Also, that there were but 10 boats on the Ohio River that could not pass under a bridge 45 ft. above high water, a height which they were willing to accept; and also that, for 18 years previous to that time, there had been on an average only 12 days in each year when those boats could not have passed under a bridge 45 ft. above high water. The increase in expense of building the bridge 53 ft. instead of 45 ft. above high water was estimated at \$500,000, which divided among the 10 boats would be an additional expense of \$50,000 incurred for each boat, in order that it might pass each year during the 12 days of extreme high water. As a continuous bridge was proposed, the board of U. S. engineers recommended to Congress that it be built 53 ft. above high water.

The surveys to determine the location and velocity of the current of the Ohio River at high water, at a medium stage and at low water, were made in 1886 and '87, by J. M. Healey, Division Engineer, assisted by S. F. Balcom, E. J. Steinbeck and L. Thompson. The method pursued was to measure carefully a base line, which was made 1,250 ft.

* Extracts from a paper by S. F. Balcom, Assistant Engineer Illinois Central Railroad, read at the annual meeting of the Illinois Society of Civil Engineers and Surveyors.

long, on the railroad embankment at North Cairo; the same base line being used in the surveys made at the three stages of water mentioned. A point was established on the Illinois shore $\frac{1}{2}$ mile up the river from the bridge site, and a line about at right angles to the current was located across the river by a foresight on the Kentucky shore. From this line, floats marked with red and white flags were started, the first one 700 ft. from the Illinois shore. Transits were placed at each end of the base line and with the transit at the upper end of the line, an angle from the base line was laid off, by means of which the float was located the required distance from the given point on the Illinois shore. When the float was in proper position, an all right signal was given and a response made as the float was loosened, at which time both transits noted the angle. At the expiration of each succeeding two minutes the angles were read, locating the position of the float. These observations were continued until the float had passed down the river at least $\frac{1}{2}$ mile below the bridge site. This process was then repeated for other floats, each succeeding float being started 700 ft. further away from the Illinois shore than the float just preceding. This work was continued until a line of floats extending across the whole width of the river had been started and their course located for a distance of $1\frac{1}{4}$ miles. The results of the survey showed the currents of the river to have practically the same direction at all three stages of water mentioned. This is a very favorable point; for at some bridges the direction of the current at high water varies as much as 45° from the direction of the current at low water. The velocity of the current at high water was found to be about 4 miles per hour, that at a medium stage to be almost as much, and at low water the current was about $3\frac{1}{2}$ miles per hour.

The topographical survey was made in November, 1886, by L. T. Moore, Chief Engineer, and J. M. Healey, Division Engineer, assisted by J. McIntyre and S. F. Balcom. The soundings were also taken at that time. The first step in this survey was to locate the west end of the bridge on the Illinois shore, and to extend the line across the river as nearly at right angles to the current as practicable. This was then produced on each side of the river and curves were run in to form the approaches that connect the bridge line with the main track. Base lines at right angles to the bridge line were then run on each side of the river; and points on these lines were marked $\frac{1}{2}$ mile apart, beginning at the bridge line. Corresponding points on each side of the river were connected, making four lines parallel with the bridge line, and $\frac{1}{2}$ mile apart—two of them being above and two below the bridge site. On these lines levels were taken on shore and soundings in the river, and the parallel lines were connected by a line of levels.

In accordance with the bill passed by Congress, a contract was made with the Union Bridge Co. for a bridge about 4,650 ft. in length and 53 ft. above high-water mark of 1883, which was 52.2 ft. above low-water mark on Cairo gauge. The bridge is to have nine through spans, two of them to be 523 ft. between centre of piers, and the remaining 7 spans about 405 ft. each; also one deck span of 253 ft. on the Kentucky side, and two deck spans of about the same length on the Illinois side. Mr. George S. Morrison is Chief Engineer of the bridge, and Mr. A. Noble is Resident Engineer in charge of the work. Messrs. Anderson and Barr are putting in the foundation work, Mr. Barr being in immediate charge.

During the summer of 1887, work on the caissons began; they were framed near the Transfer Incline on the Illinois side, and when completed were launched and towed to position, about 1 mile up the river. The caissons for the foundations of the three channel piers are 70 ft. long and 30 ft. wide. They consist of an outside wall of 12 by 12-in. timbers, of yellow pine, laid one on top of another and firmly bolted and fastened together. On the outside of this 12-in. wall, a 3-in. course of oak plank is spiked, being placed diagonally; and this course of planking covered by another, placed vertically. The corners are rounded and covered by curved plates of boiler iron. At the bottom, a cutting edge is formed by a vertical plate of boiler iron, which is riveted to a horizontal plate that is securely fastened to the lower side of the side walls. These two plates are firmly braced and stiffened at short intervals on the inside, by angle plates and braces, riveted to each plate. This cutting edge extends around the caisson, and is rounded at the corners. Just above the cutting edge, an inner wall is started, which springs from the outer wall at an angle of 45° . This wall is formed of 17-in. square timbers, which extend clear across, and the ends are framed into the outer walls. As these inner walls stand at an angle, their intersection with each other, at the corners of the working chamber, forms a very complicated joint, as the timbers have to cross each other and extend on to the outer walls. For this reason, the timbers in these walls are made 17 in. square, which, standing at an angle, makes their face occupy a vertical distance of 12 in., and so correspond with the timbers in the outer walls. This inner wall is carried up until a vertical height of 6 ft. above the top of the cutting edge is reached, when a timber ceiling is made over the top of the working chamber, and this course of timber covered below with oak plank, which have the joints or seams tightly calked to prevent the escape of compressed air. After the caisson has been towed into place and anchored to piles, the triangular space between the outer and inner walls mentioned is filled with concrete. The outer wall is continued up and a crib work is formed by three rows of timbers lengthwise and seven rows crosswise, placed in alternate layers, one on top of the other, and bolted where they cross. The ends of these timbers are framed into the side walls, and all open spaces in the crib work are filled with concrete.

The crib work above the caisson in the three channel tiers is 34 ft. in height. This, with the 16 ft. of caisson, gives a foundation 50 ft. in depth. In the three channel piers the lower course of stonework is 26 ft. wide and 66 ft. long. The ends of the piers are in the form of pointed arches, and at the base are formed with 20-ft. radii. The stone work of the piers is being done by Messrs. Loss & Wilson, with Mr. Loss in charge. The stone used comes from Bedford, Ind., and is a light-colored limestone that can be quarried in almost any thickness, and is easily worked. It hardens on exposure, and in local structures shows indications of durability. It was also used in the Henderson bridge. It is cut at the quarries to the dimensions furnished by the resident engineer, a plan of each course being made. The courses are from 24 to 36 in. in thickness, and the backing is made of the same thickness and quality of stone. Broken joints are required, but the edges of the stones in the backing are not required to be dressed. The granite used comes from New Hampshire, and is only used in the cut-water or end stones of the courses, between high and low-water lines, at the up-stream end of the piers.

The stone used for concrete is a very hard, dark colored limestone, quarried at the Ullin Lime Kilns, about 22 miles north of Cairo, and is broken with a stone crusher. The concrete over the working chamber is made of 2 parts of stone, 2 of sand, and 1 of cement. That in the crib work is made of 4 parts of stone, 2 of sand, and 1 of cement. When the caisson has been sunk to the required depth, the working chamber is made tight around the edges and over the bottom with a coating of 3 parts of sand to 1 of cement, and is then filled with concrete made of 3 parts of stone, 2 of sand and 1 of cement. The cement used is mainly Alsen's Portland cement for bottom, sides, etc., of caisson and for laying face stones in the piers. Louisville cement is used for backing in piers, concrete in crib work and caisson, etc.; except in freezing weather, when Portland cement is used. Mortar joints, and beds of face stones, are made $\frac{1}{2}$ in., and the mortar is made of 2 parts of sand to 1 of cement for face stones, and 3 parts of sand to 1 of cement for backing.

It was the intention to have the three channel piers so far completed, that the usual high water of January and February would not delay the completion of those piers. The January rise, however, being quite rapid, the third foundation was submerged, so that very little more can be done to it until the water goes down in the spring or summer. The foundation of the pier next to the Illinois shore was sunk 75 ft. below low water and the masonry completed up to high-water line previous to Jan. 1, 1888. The foundation of the second pier was sunk to the same depth, and the stone work kept ahead of the rising water in the river. When not delayed, these foundations were lowered at an average rate of about two feet per day. Some trouble was experienced from scouring, next to the foundation that is under water. At one time, the up stream end of the caisson was 14 ft. lower than the opposite end and the excavation made by the current was still 2 ft. lower. At that time work on the cribbing was abandoned and the caisson sunk into position again. Should the scouring continue, so that the foundation is carried so far out of place that it cannot be shifted into position again, it will present a serious obstacle and possibly necessitate a change in the location of the pier and in the length of the bridge spans to correspond.

At the end of the coming season a large portion of the foundation work will probably be complete, and work on the steel superstructure well under way.

In the brief discussion which followed the reading of this paper, Mr. Balcom said that the caisson which had given trouble was nearly righted, and was very little out of position.

TECHNICAL.

Locomotive Building.

The Rhode Island Locomotive Works have contracted to build ten consolidation locomotives for the Louisville & Nashville.

H. K. Porter & Co., of Pittsburgh, are running quite full on orders mostly from the South and West for contractors' and mine and logging engines. They have under way a number of noiseless motors for street railroads. They built last year 30 of these motors, some of which work on grades of 500 ft. per mile.

The Dickson Co., of Scranton, have obtained a contract for 10 freight and 6 passenger engines for the Central of Georgia. The freight engines are Moguls, 18 x 24 cylinders, with about 81,000 lbs. on the drivers, which are 57 in. diameter on tread. The passenger engines have 17 x 24 cylinders, and the driving wheels are 63 in. diameter on tread, the adhesion weight being 58,000 lbs. and the total weight in working order about 92,000 lbs. These engines will be somewhat heavier and more powerful than any hitherto built for the Central of Georgia.

Car Notes.

The Georgia Pacific has purchased 10 of the patent side dump cars made by the Blaine Car Mfg. Co., of Dayton, O., and it is said they are so satisfactory that the company intends ordering a large number.

The Burton Stock Car Co. is building at its new works at Wichita, Kan., 750 stock cars of the latest pattern and 20 cars for the transportation of horses.

The Louisville & Nashville has placed in service five new passenger cars between Louisville and Shelbyville, Ky., and also a number on the Alabama division of the road.

James Harris & Co. have completed work on an order for 30 patent ballast dumping cars for the Temiscouata road at their shops in St. Johns, N. B. They will soon commence building a number of coal cars for the same road.

The Barney & Smith Manufacturing Co., of Dayton, O., will soon commence building 100 box cars for the Mexican Central. They have also an order for 1,000 box and gondola cars for the Chesapeake & Ohio, to be completed Aug. 31. The box cars are to be of 40,000 lbs. capacity, and will be equipped with the Wagner car door. The coal cars will be 50,000 lbs. capacity.

The Montgomery & Florida is constructing a number of new box and flat cars at its shops.

Bridge Notes.

The Canton Wrought Iron Bridge Co. has contracted to build an iron bridge over Lick Run, at Ravenswood, W. Va. The Marietta, Columbus & Northern has just completed an iron bridge over Federal Creek, in Athens County, Ohio.

The Detroit Bridge & Iron Works, Detroit, Mich., has lately completed a steel and iron bridge over the Wabash River at Terre Haute, Ind., for the Terre Haute & Indianapolis.

The New Jersey Steel & Iron Co., of Trenton, N. J., has contracted to build an iron bridge over the Yazoo River, on the western extension of the Georgia Pacific. It is to be 441 ft. long, with a draw span of 286 ft.

The Atlanta Bridge & Axle Co. has also contracted to build a 296 ft. iron drawbridge over the Sunflower River, in Sunflower County, Miss., for the same road.

The County Commissioners will build an iron bridge at Waldoboro, Me.

The Commissioners of Green Bay, Mich., will build a bridge at a cost of about \$15,000.

The Central of Georgia has lately awarded the contract for 22 spans of riveted iron bridges chiefly to replace old wooden spans on the line of the road to the Atlanta Bridge & Axle Co. This includes a new draw-bridge across Chattahoochee River at Columbia, Ala., the present end of the Blakely extension.

The King Iron Bridge & Manufacturing Co., of Cleveland, O., expects to have the two new buildings, it is erecting completed by June 15. A tract of nine acres of land has been secured east of Madison street, on the Cleveland & Pittsburgh Railroad. The buildings are each 70 x 800 ft., and when completed the present capacity of the works will be doubled.

The County Commissioners will build an iron bridge at Cuttingsville, Vt.

The contract has been let to H. H. Pike & Son, of Cambridge, Mass., for constructing a stone bridge at Waltham. The bridge will have three arches, each 40 ft. span, and the contract price is \$30,000.

The County Commissioners will build a bridge at Pocopson, Pa.

It is stated that the County Commissioners of Collin County, Tex., will rebuild 14 bridges recently destroyed by floods.

The County Commissioners will erect two bridges at Dunlap, Tex.

The Quincy & Beardstown will construct a bridge over the Illinois River near La Grange, Ill., when construction work commences.

The Lake Superior & Pacific will construct several short bridges from 100 to 300 ft. long across the St. Louis River.

The Louisville Bridge Co. will shortly commence the erection of an iron bridge 300 ft. long at Verbena, Ala.

Manufacturing and Business.

The crossing signal manufactured by Street's Signal Co. has been placed at the Detroit street crossing of the New York, Chicago & St. Louis in Cleveland.

It is reported that the Cowell buffer coupler has been adopted by the Wagner Palace Car Co. as its standard, and they have already equipped about 100 cars with it. They are also being used on three leading roads, and negotiations are pending with several others.

Chas. A. Schieren & Co. report, among others, the following recent sales of their Brooklyn rawhide lace leather: J. W. Livezey & Co., Newport, Ky.; F. A. Chase & Co., Providence, R. I.; Taylor Iron Works, High Bridge, N. J.; Wm. McIlvain & Sons, Reading, Pa.; Mexican Central Railway Co., El Paso, Tex.; H. & H. Simon, Easton, Pa.; S. Ballard & Co., New York City; Chas. MacEvoy, Newark, N. J.; W. B. Meel & Co., Savannah, Ga.

The Railway Indicator Co. has been incorporated in Cincinnati, O., with a capital stock of \$100,000, by John J. Perkins, Jacob S. Loper and others.

The following bids for pumping machinery and boilers, etc., for the new system of water-works at Clarksburg, W. Va., were opened May 15: Hall Steam Pump Co., \$4,360; A. C. Osborn, Worthington pump, \$4,720; Deane pump, \$4,770; Deane Steam Pump Co., \$5,200; Cox & Morrison, \$5,460; Gordon & Maxwell Co., \$5,500; J. H. Harlow & Co., \$5,600; Knowles Steam Pump Co., \$6,250; National Iron Works, \$6,500; Holly Manufacturing Co., \$8,150; D. W. C. Carroll & Co., boilers only, \$2,100; Ritter & Conley, boilers only, \$1,644. The requisitions called for two 500,000 gallon duplicate direct-acting pumps, two 54 x 12 in. tubular boilers, all complete. The contract was awarded to A. C. Osborn on his bid on the Deane pump.

The Pullman Car Co. has purchased from Walcott & Wright, of Indianapolis, Ind., 87,000 ft. of yellow pine lumber, which is to be delivered July 15.

The Capital Construction Co. has been organized in Frankfort, Ky., with the following officers: J. M. Thomas, President, Cincinnati; Grant Green, Treasurer, and R. W. McRory, Secretary, Frankfort. The company will bid upon the construction of the Kentucky Midland from Frankfort to Owingsville.

The Electrical Accumulator Co., of New York, has recently closed a contract with a road in the Argentine Republic for lighting 20 day coaches and two sleeping cars, by the storage battery system.

The Railroad Equipment Co., of Minnesota, with office at St. Paul, has been chartered with a capital stock of \$3,000,000. The incorporators are: Frederick Billings, of Woodstock, Vt.; Brayton Ives, Colgate Hoyt and Robert Harris, of New York City, and Thomas F. Oakes, of St. Paul.

The Birmingham Bridge and Bolt Works have received a contract to furnish the East Tennessee, Virginia & Georgia with \$10,000 worth of architectural iron, for the erection of new depots along the line.

The Panama Electric Light Co., which has lighted Colon satisfactorily for the year past, and has a concession from the government for lighting the city of Panama, is actively engaged in the preliminary arrangements for the introduction of the electric light there. Mr. Chas. W. Grant, an electrician of the Thomson-Houston Electric Co., of Boston, has arrived on the Isthmus to superintend the erection of the plant. The bulk of the machinery is already on the ground. One arc dynamo, for the outside lights, and one incandescent dynamo to carry 1,000 lamps on the alternating system, for the inside lights, will be used. The company will start with 45 arc lights in the streets of the city. Almost 400 incandescent lights, for inside purposes, have already been engaged.

Iron and Steel.

The Rolling Mill of the Norristown Iron Works was closed May 23 for an indefinite period.

The plant of the Pennsylvania Tube Works, at Pittsburgh, will be closed during June, and it is thought that it will not start before fall. About 700 men will be affected.

No. 2 furnace of the Pennsylvania Steel Co., at Steelton, Pa., has resumed operations, after being relined and repaired. All the furnaces of the company are now in blast, with the exception of one, which is being repaired.

The rolling mill of the Stewart Iron Co., Limited, at Sharon, Pa., has closed for an indefinite period. The mill employed about 40 men.

The plant of the Stony Creek Rolling Co., Limited, at

Norristown, Pa., has been closed for an indefinite period. It is stated that final arrangements have been made between the Northern Pacific Railroad and the Moss Bay Steel Co., of England, for establishing extensive steel works in Washington Territory. The steel company agrees to furnish

The Cincinnati Forge & Iron Co. has completed the rebuilding of its works at Cincinnati, and they have been started up on car axles and other forgings.

The Rail Market.

Steel Rails.—The market is weak, with nominal prices at Eastern mills \$30.50 to \$31.

Old Rails.—Market dull, quotations at \$20 to \$20.50.

Rail Fastenings.—Spikes are quoted at 2.05 to 2.10; angle plates, 1.85 to 1.9, delivered.

The Owego.

The new lake steamer "Owego" belonging to the Union Steamboat Co. (New York, Lake Erie & Western) arrived at Chicago, May 23, and is said to be the largest steamer on the lakes. Her dimensions are: Length over all, 351 ft.; between perpendiculars, 326 ft.; depth molded at lowest point, 25 ft. 6 in.; beam molded, 41 ft. The hull is entirely of steel, excepting a few iron parts of the internal inclosures about engines and boilers. She has steam apparatus for handling cargo, steering, etc. The triple expansion engines are to work under a boiler pressure of 160 lbs. per sq. in. The cylinders are 28 in., 42½ in., and 72 in. dia., and 54 in. stroke. These engines are managed from the lower engine room from the level of the shaft, and steam is supplied by six boilers, each 11 ft. 6 in. long.

The fire-room runs fore and aft between the two sets of boilers, which face each other; each boiler has two furnaces 39 in. dia., grate bars 6 ft. long, making about 240 sq. ft. grate surface. These furnaces are the Fox patent corrugated, imported from England, and are the first of the kind on the lakes. The shell plates of these boilers are ½ in. thick, riveted by hydraulic power, and all holes drilled in place.

Aluminum Alloys in Steel Making.

The Iron Trade Review states that very favorable results have been obtained from the use of aluminum alloys in connection with steel castings. Experiments made in Cleveland show that, in a bath of 16,000 lbs. of steel, charged with one-tenth of one per cent. of aluminum, the resulting metal exhibited an entire absence of blow-holes, a six-fold increase in tensile strength, and a corresponding increase in transverse strength. Moreover, the addition of as small a percentage as 1 lb. of aluminum to a ton of steel was shown to impart to the latter a capacity of yielding a perfect weld with wrought iron, the particles of both materials appearing under the microscope to be of about the same cohesiveness.

The "quieting" effect of aluminum in the steel bath, liberates accumulated gases, and it is believed that the introduction of ferro-aluminum increases the fluidity of the steel. The present market price of aluminum, \$4.00 per lb., is, however, too high to render its use general.

Mr. Hibbard, who has made many experiments on the subject, says:

We made a heat of the steel about .18 carbon and .41 manganese and 1.10 per cent. of aluminum in it, and it tested remarkably well. The stock was very ordinary, but one-tenth of one per cent. phosphorus, and half as much sulphur. The average tensile strength of that rolled into half inch plates was about 70,000 lbs., and the elongation, about 26½ per cent., very good results for ordinary steel. Without the aluminum we would have had perhaps 65,000 lbs. tensile, with probably 22 or 23 per cent. elongation. The effect of the aluminum probably increased the tensile strain 5,000 lbs. and the elongation 3 per cent. The ingot was absolutely solid and the metal when forged turned up very well. The chips came off regularly and smoothly. It was excellent steel.

Comparative Use of Iron and Steel.

Some interesting facts and figures relating to steel were given at the recent annual meeting of the Iron and Steel Institute of Great Britain. The extent to which steel is superseding iron was shown by the following table of the total product of Great Britain in thousands of gross tons for the periods named:

	1884. 1 = 1,000	1887. 1 = 1,000	1884. 1 = 1,000	1887. 1 = 1,000	Per cent.
Manufactured iron.....	Tons. 2,237	Tons. 1,701	Tons. —536		-24
Bessemer steel ingots....	1,399	2,064	+765		+59
Open-hearth ingots.....	475	981	+506		+106

The production of Bessemer steel in the eight chief iron and steel producing countries of the world amounted last year to 7,269,767 tons, as compared with 6,034,115 tons in 1886, showing an increase of 1,235,652 tons, or 20 per cent. The production of open-hearth steel in the same countries in 1887 was 1,672,340 tons, being an increase of 450,419 tons on the previous year.

Speed of Trains in United States and Europe.

The following comparison of the speed of fast trains in different countries is made by taking a journey of about 200 miles from the capital or principal city of the countries named below:

Country.	Journey.	Distance.	Time.	No. of Stops.	Speed including Stops.
United States.	New York—Boston.	234	60	6	39*
"	New York—Washington.	226	5 18	3	42 7
England.....	London—Manchester.	203½	4 15	2	48*
France.....	Paris—Dijon.....	196	5 33	2	36
Germany.....	Berlin—Minden.....	199	5 33	7	36
Austria.....	Vienna—Pisa.....	217	6 45	11	33
Italy.....	Rome—Pisa.....	208	7 0	8	29.5
Spain.....	Madrid—Saragossa.....	211	9 28	9	22
Portugal.....	Lisbon—Oporto.....	209	11 0	18	18.5*

Trains marked * carry passengers at the ordinary rate of fare. The time and distance for the Pennsylvania train running to Washington is given from Jersey City. It will be seen that the fastest trains in this country exceed in speed those of any other country, England alone excepted. The Railway Press, to which we are indebted for some of these figures, states that the average speed of the six Continental expresses referred to is only a trifle above 29 miles an hour, while the average speed of trains carrying passenger at the ordinary rate of fare for the same journeys is about 26 miles an hour, and the average number of stops is 8 for express trains and 12 for those carrying passengers at ordinary rates.

Deafening Floors.

The Building News states that various expedients have been used and suggestions given for "deafening" floors, including dry lime, rubbish, sand, lime, hair, and dry ashes, sawdust, and even corkle shells and cork chippings have been found in the floors of old houses. Any of these materials in layers of 1½ in. to 2 in. will suffice to deaden sound. Thick felt laid below the floor boards is also suggested, and General Loyre proposes shavings which have been rendered incombustible by dipping them in a tub of thick whitewash. Soft substances inclosing air spaces form an excellent non-conducting material to sound, and shavings so treated will be found of great service, and are incombustible. Where it is desired to disinfect the space between the floor and ceiling the shavings may be saturated with chloride of zinc, or the latter may be added to the lime wash. Slag wool made in the form of tiles or bricks is a good material to prevent the transmission of sound, and any fibrous material formed into cellular slabs answers the purpose.

THE SCRAP HEAP.

Foreign Notes.

The French War Office includes among the new defensive measures contemplated a system of narrow gauge railways to connect five of the six forts round Belfort. The roadways of these lines are to be sunk sufficiently below the surface to protect the trains from an enemy's fire.

The first line of railroad in what is called the Holy Land, which is to be constructed by a Belgian company under a concession from the Sultan, will run from Jerusalem to Jaffa. It is reported that sleepers, telegraph wire and rolling stock have already arrived. The notions of this land will not be the same with our children as with us.

The course to be followed by the proposed Siberian Railway has now been finally mapped out. The line, when completed, will run from Tomsk in the west to Vladivostok on the Pacific coast, and connect the following intermediate places: Marjinsk, Atchinsk, Krasnojarsk, Nijnj Oudinsk, Irkutsk, Posolskoi, Verkne, Oudinsk, Chita, Nerchinsk, Sretensk, Graskipport and Nikolskoi.

A belt line 10½ miles long is to be constructed through the northern suburbs of Melbourne (Victoria), at an estimated cost of \$625,000.

The completion of the 2,000th locomotive in the Austro-Hungarian state railroad workshops at Vienna was celebrated by a festival on May 1. The greater portion of these locomotives were designed and completed under the superintendence of two Englishmen, Messrs. Hardy and Haswell, who were connected with these railroads for forty years.

The Oil Pipe Line to Chicago.

The Standard Oil Company is laying two lines of pipe from the Lima oil fields to Chicago, a distance of 210 miles, one 8 in. and another 6 in. in diameter, to deliver 10,000 barrels of oil per day. It is said that only one pump will be used on the 8-in. pipe line, showing a marked increase in the power and duty obtained from pumps since oil pipe lines were initiated, as at that time 5 miles was about the maximum distance at which pumps were spaced. The 8-in. line is intended to convey crude oil for furnace and manufacturing use, and the 6-in. pipe for what is called stove oil for domestic consumption.

It is proposed to have the line completed by July 1. The storage tanks will be located at Hegeswich, near the lake, which will be a point of distribution both by water to other lake ports and by pipe lines to large consumers and to separate centres of tankage, from which smaller consumers and the domestic consumption will be supplied by wagons. The Western Manufacturer gives a table of comparative values of coal and oil, based on the results of many experiments, showing that for steam making three and one-quarter barrels of crude Ohio oil are equal to a ton of ordinary bituminous coal.

Strike at Paterson.

The 40 hands employed in the foundry of the Cooke Locomotive Works at Paterson, N. J., went on strike May 27 without notice because the new foreman, John F. Daniels, formerly of the Rhode Island Locomotive Works, insists upon stricter discipline. When the great strike of the molders in the locomotive establishments at Paterson was settled a year or two ago, a written contract was entered into by the men and their employers that, in case the latter had any grievance, they were to complain first to their employers, and if that failed then to the District Executive Committee, and finally to the General Executive Board, but work was not to cease until the latter had determined the appeal. It is said that as the men have quit work without notice they have broken the agreement, and will not be taken back in a body, but only as individuals on personal application.

Joggins's Troubles.

The poor have their woes as well as the rich, and a distinguished novelist has shown us that soul harrowing crises may occur when one is "Far from the Madding Crowd." A railroad in the backwoods suffers from just such misfortunes as happen to a trunk line basking in the sunlight of metropolitan publicity with its pockets stuffed with vestibules and other luxuries. A little road in Nova Scotia, so small that the Official Guide ignores it, Rand McNally never heard of it, and even the Pathfinder snubs it, has just suffered a fearful misfortune. It is the Joggins Railroad. The Joggins Railroad has one engine. Just because it is a lone engine it has been pounced upon by a force of 60,000, 000 foot-pounds. This immense force had been in training under John L. Sullivan, as will be seen by the scientific terms used in describing the blow which it gave the innocent locomotive. Let the Halifax Herald tell the blood curdling details:

"ACCIDENT.—The locomotive of the Joggins Railway has been badly demoralized. It was standing on the track at Maccan on Saturday, when a runaway car of deals came crashing into it. The car was being loaded about three miles upon the Joggins line, and by some means got beyond the control of the men who were loading it, and the whole distance to the Intercolonial being down grade, it got a good start and made that three miles at the rate of 75 miles an hour. One man working on his farm heard something whiz by, and looking up saw what he supposed was the trail of the Flying Dutchman. A Mr. Baker, who claims to be an expert on speed and distances, says the car ran the three miles within a minute. When it arrived at Maccan, it struck the locomotive right between the eyes and was split in two, the deals flying off on either side, to a distance of 30 to 50 ft. The locomotive was so badly battered that she has gone to St. John for repairs."

Every right minded reader will, of course, applaud as the curtain drops on the discomfited load of pine boards. Mr. Baker being an "expert on distances," however, we must protest against his verdict. An expert on distances can, of course, move the mile stones nearer together or refrigerate the rails, causing them to contract, or adopt any one of a dozen cunning devices to get a car over the road at 180 miles an hour. But all this is not fair play. Experts have no right to apply their arts to distances. We even make bold to challenge this man Baker. Supposing that the Joggins Railroad is so admirably laid that trains

run on it without friction—and it must be a first-class track, or a speed of 180 miles per hour would be unattainable—supposing, we may repeat, that friction and train resistance and all that sort of thing retire into the distance and leave Joggins alone, and go and meditate with those logs scattered about in the wide, wide ocean, without a shepherd, a guide, a pilot or even a red light, then natural law steps in and announces that in the name of the laws of gravity and virtual velocities, one and indivisible, that even on Joggins' road a velocity of 180 miles per hour implies a virtual fall of 1,080 ft. If Joggins' line descends this distance in the one mile, in which apparently the truant deals acquired their speed, then this speed becomes possible, the track being so excellent that Dr. Dudley's dynamograph car might pass over it in vain, and Joggins' cars run over it without friction.

Brass Checks for Passengers.

Americans traveling in Europe, and especially in England, miss the brass baggage check more than perhaps any feature of travel peculiar to this country. Few, however, have suspected that on one of the oldest English lines, passengers themselves were, from 1832 to 1846, checked with an orthodox brass check, which is shown on a reduced scale in the accompanying illustration. The following extract from the London Railway Press explains the manner in which these checks were used:

The old brass railway tickets used on the Leicester & Swannington Railway measured 1½ in. across and if a passenger were going from any station, Bagworth, for instance, ticket No. 20 would be issued to him, and this number and the amount of fare paid would be duly recorded in a book. The guard of the train carried a leather bag, something in the form of a collecting-box, having a separate division for each station, into which the tickets were placed when collected, and returned to the station from whence they were issued, to be again used. One of these tickets has been presented to the South Kensington Museum, where in company with the Rocket and other early relics, it will serve to astonish future generations when balloons or Vril or Keely's motors have long since superseded railroads.

Storm and Floods.

On May 26, 27 and 28 heavy rains caused serious damage to railroads in large sections of country. In the vicinity of Shamokin, Pa., there were numerous landslides and wash-outs on the Philadelphia & Reading and Lehigh Valley roads. In Nebraska a cloud-burst caused a tremendous flood and five miles of the Fremont, Elkhorn & Missouri Valley road were inundated and the ballast almost entirely washed out.

Paddy the Puzzler.

The above is the name placed at the head of a list of tramps who haunt the New York division of the Pennsylvania road. "Paddy the Puzzler" has served five years in prison for butchering two men. Other habits of the grassy slopes of the New Jersey division are: "Gypsy Tom," a treacherous fellow; "Tinker Jack," "Dublin Dan," "Monk," "Chicago Jack," a clever thief; "Fatty the Hatter," "Newark Fatty," who can use a knife like an Italian; "Spotty," "Slim Jim," "Blinker Tom," "English Jack" and others who will do anything rather than work. The railroad company has, says a contemporary, sent out a corps of detectives on a crusade against these tramps. "We don't want to hear from you until the war is over," the railroad officials said to the detectives, "and the tramps are either in jail or in Delaware."

The detectives have already encountered some of the most desperate and defiant of them, including some who are but recently from the Trenton prison and the various county jails. It is said that there are probably several hundred of them.

A Smoke on a Blockaded Train.

"Talking about ingenuity," said the drummer, "I want to tell you what I saw last winter out West. I was on a train that was snowed in for three days. The company sent us food, but they didn't send any cigars, and the train boy's stock was exhausted the first day. In the express car we found and confiscated a box of smoking tobacco, but there wasn't a pipe on the train. Among the passengers was a Connecticut Yankee who was just dying for a smoke. He got out in the snow and looked around for a weed, or something of that sort, which he might use in making a pipe, but couldn't find a thing. 'I'm going to have a pipe, anyhow,' he said. So he took a lead pencil, opened the wood, took out the lead, and, placing the two strips together again, wound them tightly with the tin foil which came off the packages of smoking tobacco, making them air tight. Then he took an apple, hollowed a bowl out of it, stuck his lead pencil stem into it, and had one of the nicest pipes you ever saw. If you don't believe it, make one for yourself some time and try."

This was a common trick in the army when we could get neither reeds nor corn cobs, and sweet pipes they made in every sense. When apples were unobtainable, which was not seldom, we fell back upon potatoes.—Exchange.

The Relative Effects of Little Things.

Gail Hamilton, who writes for the North American Review and the Northwestern Railroader, has discovered that trifles mean more to railroad officers than to most folks. She says:

"Just here I stopped to give an unexpected friend a luncheon. In five minutes I broke the teapot and lost the tea; in seven I upset the coffee-pot and lost the coffee; in ten the milk boiled over on the alcohol lamp and all literally went by the board. But it meant only a cold bite, a good joke, an uproar of laughter. Just such things—no larger—on a railroad mean death."

"The General."

The historic locomotive of the Western & Atlantic, of the above name, which, as all railroad men know, was distinguished by being stolen by a party of Union raiders, in April, 1862, and which has been in regular train service for most of the time since the war, has now been degraded to the menial service of hauling a gravel train, being used in the construction of a branch railroad which is to engage in the vulgar business of transporting iron ore. Such is fame!

New Method of Procuring Aluminum.

In the Comptes Rendus Mr. G. A. Faurie gives the following method of procuring aluminum: Two parts of pure, finely-powdered clay are mixed into a paste with one part mineral oil or other hydrocarbon. One part sulphuric acid is then added, and the mixture is carefully agitated until it becomes a uniform mass of a yellowish color. Afterward the mass is heated in a crucible to a temperature of about 800 deg. C. (1,492 deg. F.), until the decomposition of the hydrocarbon is complete, when it is allowed to cool. The obtained product is powdered and mixed with an equal weight of any metal dust. This mass is then heated to white heat in a closed graphite crucible. After cooling, a number of metal beads are found in the crucible, which are an alloy of aluminum and of the other metal used, out of which the aluminum can be easily separated. According to the inventor, the same method can be employed for separating silicon, calcium, magnesium, etc., from their oxides.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Colorado the Federal Court holds that where land is conveyed upon consideration that a railroad company is to "locate, erect, and maintain" upon the land its depot, and in pursuance of the conveyance the depot is erected and maintained for 11 years, and then is removed, the land does not revert. It is only a failure of part of the consideration, entitling the grantor to his action at law therefore.¹

In Georgia the plaintiffs sued a railroad on a draft drawn by Ferguson & Co., who were engaged in grading its road-bed and accepted by defendant in the following words: "Accepted; payable when chief engineer estimates for grading done, if the amount found to be due Ferguson & Co. is not consumed by acceptances bearing prior date to this one." It was shown that according to an estimate of the engineer, made before plaintiffs brought suit, the company was indebted to Ferguson & Co. in an amount exceeding plaintiffs' demands, over and above prior acceptances. The Supreme Court decide that the plaintiffs are entitled to recover.²

In a case in Michigan a debt was contracted in Indiana, where one month's wages of employes is exempt from execution and attachment; both contracting parties being residents of that state. The debtor was in the employ of a railroad company in that state, and his wages were payable there. The debt was assigned to a resident of Michigan, where such wages are not exempt. The Supreme Court holds, in garnishment proceedings in Michigan, that the debtor having done no act whereby to subject himself to the jurisdiction of the courts of Michigan, the exemption of his wages becomes a vested right *in rem*, which follows the debt, though it be not transferred to evade the exemption law and necessarily so where that is the object of the transfer.³

In New York the Court of Appeals rules that where the attempted incorporation of a railroad company under the Rapid Transit Act of 1865 has been decided by the courts to be defective by reason of the failure of the articles of association to comply with essential requirements of the act, the attempted incorporation is void, and a valid incorporation cannot be thereafter effected by amending such articles. The statute of 1870, permitting the amendment of certificates of incorporation of companies organized under general acts, does not apply to this act. The powers of the commissioners appointed by the mayor under the act of 1875 close with the completion of their duties and they cannot afterwards amend their certificate. The Court also holds that the Supreme Court has no jurisdiction to appoint commissioners to determine upon plans for the construction of a railway under the Rapid Transit Act, unless there has been a refusal of property owners to consent to such construction, after the presentation of plans which comply with the intent and requirements of the act.⁴

The charter of the Illinois Central Railroad granted it the right to take and use all such lands and waters belonging to the state as were necessary to the construction and complete operation of the road, provided such use did not interrupt navigation of the waters. The United States Circuit Court in Illinois decrees that, upon the consent from the city of Chicago to enter its limits, the company had the right to erect piers and breakwaters, and fill in the shallow waters of Lake Michigan within the city limits, and use the ground thus made for its roadbed, provided the piers and breakwaters did not interfere with navigation. The Illinois statute of 1869 granted the defendant company certain submerged lands in the harbor of Chicago in fee, with a proviso that defendant should not have power to alienate such lands, and that the gross receipts from the use, profits and lease of the lands, or improvements thereon, should be a part of the gross receipts of the company for the purposes of taxation. It was also provided that the harbor should not be obstructed or the right of navigation impaired, and that the legislature might regulate the rates of wharfage and dockage. The Court rules that the grant was in trust only, with the additional privilege to make certain improvements in the harbor, and was revocable, except as to such lands as, at the time of the repeal thereof, had already been improved and reclaimed upon the faith of the grant. The same act gave the company certain lands in fee, upon payment of a certain sum to the city within the limits of which the land was situated. A tender of the money was made, but the city refused to receive it. The Court rules that a failure to keep the tender good deprived the defendants of all rights acquired thereunder.⁵

Carriage of Goods and Injuries to Property.

In Pennsylvania a quantity of syrup was shipped at owner's risk of leakage. On arrival at its destination it was discovered that some of the barrel heads were stove in, the staves of others were buckled, and others were hopeless, and 532 gallons of the syrup had wasted. In an action for this loss there was some evidence that the barrels were not properly constructed. On the other hand, it was proved that many shipments had been made from and to the same parties in similar barrels and none were ever damaged. The Supreme Court affirms a verdict against the carrier for the loss.⁶

In Georgia a shipper made misrepresentation as to the nature of the goods shipped, representing them to be household goods, when in fact a part consisted of jewelry and wearing apparel. The Supreme Court holds that the company was exempt from liability as to the jewelry and wearing apparel, for the reason that it never contracted to carry such, but was not exempt as to the household goods, which it did contract to carry.⁷

In North Carolina the Supreme Court rules that it is not negligence *per se* to pasture cattle in a forty acre lot through which a railroad runs, although the stock law is in force in the county.⁸

In Iowa a city leased public grounds, dedicated to it for highway purposes, to a railroad company, for "railway and depot purposes," reserving the right of way to a bridge abutting on the grounds, and imposing on the company the duty of keeping such right of way in repair, and also reserving so much of the grounds as might be necessary in making repairs on the bridge. Defendant, as successor of that company, in addition to the depot and railway leading to it, built a turn-table and round-house on the grounds, which interfered with the passage of persons and teams across them. The Supreme Court holds that the obstruction caused by the round-house and turn-table was a nuisance, notwithstanding there was a sidewalk passing over the grounds. The plaintiff in this case was engaged in business on a street to which persons came via the bridge. The building of the round-house and turn-table compelled persons coming to plaintiff's place of business to take a circuitous route. The Court holds that this constitutes sufficient special damage to plaintiff to support an action to abate the nuisance.⁹

Injuries to Passengers, Employees and Strangers.

In New York a female passenger had entered a car standing alone at the station before the train was made up. Afterwards, in the making up of the train, another car was run against it with such force as to throw her to the floor and injure her. The railroad claimed that she had no right to be there, but the Federal Court affirms a verdict in her favor, saying: "She made a complete *prima facie* case, unless it

can be successfully claimed that it is negligence *per se* to enter a detached car in the apparently proper position, and in apparently prepared readiness, with gang-planks, except that it was detached, at the time designated for the departure of the train, with the other passengers, and without known objection from the carrier. Such a claim cannot properly be made, for it is a fact, known to almost every traveler, that detached cars are often habitually placed, especially at intermediate stations, for the very purpose of receiving and accommodating passengers, and having the car in readiness to be attached to a train or locomotive which is soon expected to arrive."¹⁰

In South Carolina a man took an early morning train, having been unable to secure a ticket, as the station was not open, and, upon the conductor's demanding 10 cents more than the price of a ticket, refused to pay more than the ticket would cost, and was consequently ejected from the train at the next station, which was not open, the weather being rough and uncomfortable. The Supreme Court holds that he is entitled to exemplary damages from the company.¹¹

In Pennsylvania the Supreme Court rules that when a street car is moving at such a slow rate of speed that a person of reasonable prudence, in the exercise of ordinary care, would not hesitate to attempt to board it, such an attempt will not be considered *per se* negligence; nor will the further fact that the attempt was made at the front platform be considered *per se* negligence when it appears that the front platform was not inclosed and passengers were permitted to enter the car by that way; in such a case the question is for the jury.¹²

In New York the Federal Court holds that if a passenger in good faith and without attempt to conceal his identity, present for his passage a non-transferable commutation ticket issued to another, and his claim is recognized, and he is carried as a passenger, he is entitled to the right of a passenger to be carried safely.¹³

In the same state and court it is held that the running of a railroad train at a high rate of speed, at an unusual hour, and without warning, past a train standing at a platform discharging its passengers, who, to reach their destination, must cross the track of the moving train, is evidence not only of neglect of common care, but of recklessness and gross negligence.¹⁴

In North Carolina, in an action against a railroad for expulsion from a train, it appeared that plaintiffs purchased limited tickets to Old Point, Va., and return; that such tickets, for the return trip, were not signed and stamped, in accordance with their conditions, at Old Point, by the company's agent there, but by a party at Norfolk, Va. The Supreme Court decides that evidence that such party was an authorized agent of defendant was admissible to show a waiver of such condition.¹⁵

In New York the Federal Court rules that an engineer and a switchman of a road are "fellow servants." This was an action to recover for the death of the former caused by a misplaced switch. It appeared that the switch target was painted green, and the plaintiff contended that if it had been red it could have been more readily seen at a distance, and enabled the deceased to stop his train in time. The Court decides that as all the switch targets on the road were green, and had been for two years, during which time the engineer had been in the employ of the company, he is presumed to have accepted it as one of the risks of the employment. A few months before the accident the company had changed the direction in which its trains ran on the two tracks. The Court rules that this did not increase the risk.¹⁶

In North Carolina a man employed in helping to transport wood on cars over a tramway was injured while attempting to replace a loose stick, which, while slipping from the car, struck a pile of wood stacked near the track, and was hurled against him. In an action against his employer for negligence in stacking the wood too near the track, the Court charged that if plaintiff was injured by the stick of wood rebounding from the wood "so negligently placed," such injury was due to the negligence of the defendant, leaving out of view the concurring agency of plaintiff, who was running the car, who had himself participated in piling the wood, and who had been repeatedly warned of danger connected with the running of the cars past it. On appeal the Supreme Court holds that the defendant was not liable.¹⁷

In Virginia a brakeman on a railroad train was ordered by the conductor to make a coupling to a car over the end of which lumber projected, making it dangerous for coupling. In obeying the order the brakeman, who knew the danger, was caught between the lumber and the next car, upon seeing which the conductor signaled the engineer to "jar ahead quickly," which was done, causing the deceased to fall, and the coupling having been made, the wheels passed over and killed him. The Supreme Court of Appeals of Virginia holds the railroad liable, the death being caused by the negligence of its agent in giving the signal without looking to see if the coupling had been made.¹⁸

In Virginia, in an action by an employe injured while uncoupling a car from some stationary cars, by the running of a coal train and pier-engine into such cars, there was evidence that, when plaintiff went in between such cars, he saw such engine stalled on the up grade, and that there was at that time only about 20 ft. between such stationary cars and the train; that he was delayed in his work by a tight coupling-pin; that the train gave no warning by bell or whistle; that the escape of steam, as the engine climbed the grade, could be heard a long distance. The Supreme Court of Appeals holds that the plaintiff's negligence was the cause of the injury, and he cannot recover.¹⁹

In the same state while the brakeman, who was a minor and upon his first trip, was coupling freight cars by order of the conductor, the conductor was so situated and so far away that he could not see the opening between the cars, nor the brakeman; so as to give the proper signals to slow up. The brakeman was killed by the cars coming together with great force. The Supreme Court rules that negligence is proved on the part of the conductor, for which the company is liable.²⁰

In Georgia, in an action against a railway company by a track-hand for personal injuries caused by being run over by one engine while avoiding another, plaintiff alleged that he received no warning, by signal or otherwise, of the approach of the train that struck him. The Supreme Court rules that the court properly charged that "If the plaintiff was injured in the manner claimed, then the burden is upon the company to show either that the injury was not caused by the negligence of its servant, the engineer, as charged, or that the plaintiff was guilty of negligence, and contributed to his injury."²¹

In the same state an employe, while rolling wheels down a track so inclined that the wheels would roll down of their own momentum, was injured by loose wheels rolling down behind him. The Supreme Court decides that evidence that the Superintendent in charge had been warned by one of the men to station a man at the top to check the wheels, in order to prevent any injury of this kind, was admissible, as tending to show negligence on the part of the railroad, and affirms a verdict against it.²²

¹ Berkley v. U. P. R. Co., 33 Fed. Rep., 794.

² S. D. & W. S. L. R. Co. v. Scheffelen, 5 S. E. Rep., 781.

³ Drake vs. L. S. & M. S. R. Co., 37 N. W. Rep., 70.

⁴ Re New York Cable Co., 11 Cent. Rep., 485.

⁵ State of Illinois v. Ill. Cent. R. Co., 33 Fed. Rep., 730.

⁶ N. Y. Cent. & H. R. Co. v. Eby, 11 Cent. Rep., 445.

⁷ C. S. R. Co. v. Moore, 5 S. E. Rep., 769.

⁸ Horner v. Williams, 5 S. E. R. p. 734.

⁹ Platt v. C. B. & Q. R. Co., 37 N. W. Rep. 108.

¹⁰ Root v. Catskill Mt. R. Co., 33 Fed. Rep., 858.

¹¹ Hall v. S. C. R. Co., 5 S. E. Rep., 623.

¹² Stager v. Ridge Ave. R. Co., 11 Cent. Rep., 427.

¹³ Robostell v. N. Y., N. H. & H. R. Co., 33 Fed. Rep., 796.

¹⁴ Id.

¹⁵ Taylor v. Seaboard & D. R. Co., 5 S. E. Rep., 750.

¹⁶ Naylor v. N. Y. Cent. & H. R. R. Co., 33 Fed. Rep., 801.

¹⁷ Meredith v. C. I. & C. Co., 5 S. E. Rep., 659.

¹⁸ Ayers v. R. & D. R. Co., 5 S. E. Rep., 582.

¹⁹ Ches. & O. R. Co. v. Lee, 5 S. E. Rep., 579.

²⁰ Johnson v. F. & A. R. Co., 5 S. E. Rep., 707.

²¹ Central R. Co. v. Small, 5 S. E. Rep., 794.

²² S. F. & W. R. Co. v. Goss, 5 S. E. Rep., 777.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Catawissa, 3½ per cent. on the preferred stock.

Lehigh Navigation Co., 2 per cent., payable June 9.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Brooklyn & Montauk, special meeting, 120 Broadway, New York, June 11.

Canada Southern, annual meeting, St. Thomas, Ont., June 6.

Chicago, Burlington & Northern, annual meeting, La Crosse, Wis., June 13.

Chicago & Eastern Illinois, annual meeting, Chicago, Ill., June 6.

Chicago, Milwaukee & St. Paul, annual meeting, Milwaukee, Wis., June 2.

Chicago & Northwestern, annual meeting, at the office in Chicago, Ill., June 7.

Chicago, Rock Island & Pacific, annual meeting, Chicago, Ill., June 6.

Chicago, St. Paul, Minneapolis & Omaha, annual meeting, Hudson, Wis., June 9.

Cincinnati, Hamilton & Dayton, annual meeting, Cincinnati, O., June 19.

Des Moines & Fort Dodge, annual meeting, Des Moines, Ia., June 7.

Milwaukee, Lake Shore & Western, annual meeting, Milwaukee, Wis., June 13.

Oregon & Transcontinental, annual meeting, Portland, Or., June 18.

Pittsburgh, Fort Wayne & Chicago, annual meeting, Pittsburgh, Pa., May 16; special meeting, June 13.

St. Joseph & Grand Island, annual meeting, Elwood, Kan., June 12.

St. Louis Alton & Terre Haute, annual meeting St. Louis, Mo., June 4.

St. Paul & Duluth, annual meeting, St. Paul, Minn., June 18.

St. Paul & Sioux City, annual meeting, St. Paul, Minn., June 9.

Toledo, St. Louis & Kansas City, annual meeting, Toledo, O., June 13.

Vermont & Massachusetts, annual meeting, Boston, Mass., June 6.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The Master Car-Builders' Association, annual convention, Alexandria Bay, N. Y., commencing June 12.

The American Railway Master Mechanics' Association, next annual convention, Thousand Islands, N. Y., June 19.

The American Society of Civil Engineers will hold its annual convention in Milwaukee, Wis., the last week of June.

The Ohio Institute of Mining Engineers will hold its summer meeting at Logan, O., commencing July 11.

The International Association of Car Accountants will hold its annual meeting in Montreal, Can., June 19.

The American Train Dispatchers' Association will hold its fifth annual meeting at Louisville, Ky., June 12.

The National Association of General Passenger and Ticket Agents will hold its fall meeting in Saratoga, N. Y., Sept. 18.

The National Association of General Baggage Agents will hold its next meeting in New York City July 18.

The New England Railroad Club meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The New York Railroad Club meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The Western Railway Club meets in Chicago the third Wednesday in each month.

The Central Railway Club meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The American Society of Civil Engineers holds meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, N. Y.

The Boston Society of Civil Engineers holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of each month.

The Western Society of Engineers holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The Engineers' Club of St. Louis meets the first and third Wednesday of each month till June.

The Engineers' Society of Western Pennsylvania meets in Pittsburgh the third Tuesday of each month.

The Missouri Association of Surveyors and Civil Engineers will hold its annual meeting at Columbia, Mo., commencing May 31.

American Institute of Electrical Engineers.

At the regular business meeting of May 15 the following officers were elected: President, Edward Weston; Vice-President, Elihu Thomson, F. R. Upton and T. C. Martin; Managers, Charles Cuttriss, Geo. B. Prescott, Jr., Wm. M. Mavor, Jr., and T. D. Lockwood; Secretary, R. W. Pope; Treasurer, Geo. M. Phelps, Jr.

Engineers' Club of Philadelphia.

A regular meeting was held May 19, 1888. Mr. Wm. F. Sellers presented an illustrated paper on the Galloway boiler. Mr. Henry G. Morris opened the discussion of "How Should the Connections be Made between the Parts of Water-tube Boilers?" which was participated in by Mr. John Overn, Chief of the Bureau of Boiler Inspectors, Philadelphia (visitor), and Messrs. M. R. Muckle, Jr., John L. Gill, Jr., J. E. Codman, Washington Jones and others, of the Club. The discussion took a wide range, covering much detail—the importance, for safety, of avoiding erroneous innovations

in design and construction being specially emphasized. Mr. Henry G. Morris exhibited, in operation, and described the Grove electric motor.

The Master Mechanics' Convention.

The Secretary of the Master Mechanics' Association, Mr. Angus Sinclair, has issued a circular concerning reduced rates to the Alexandria Bay Convention, saying that the negotiations have terminated in the following letter from Mr. Daniels, Vice-Chairman of the Central Traffic Association:

"Saturday evening I received a telegram from Mr. S. F. Pierson, Chairman of the Trunk Line Passenger Association, New York, stating that it was impracticable to use the certificate plan for your meeting at Alexandria Bay in June next.

"I regret this very much, as it will necessitate our withdrawing the notice I sent you May 16 (Form 7), stating that rate of a fare and one-third has been authorized by this Association.

"Under our rules we cannot grant round trip tickets for these meetings; the attendance will not warrant our asking for the concession."

The Milwaukee Meeting of the American Society of Civil Engineers.

The engineers of Milwaukee are preparing to make the visit of the American Society to that city pleasant and profitable, and no doubt they will be equal to the occasion. The local committees appointed are: Arrangements, George H. Benzenberg, S. A. Harrison, F. W. Kimball, O. Bates and C. J. Peetsch; finance, Don J. Whittemore, E. P. Allis, Charles L. Colby, Albert Courroie, F. N. Finney and H. J. Hilbert.

No Reduction of Fare to or from the Master Car-Builders' Convention.

New York, May 29, 1888.
The Trunk Line and the Central Traffic Associations advise me that it is impracticable to grant a reduction of fare from the Master Car-Builders' Convention, and they withdraw the concession referred to in the notice dated May 15 over my signature. There will, therefore, not be any reduction of the regular fare either to or from the Convention, as was announced.

M. N. FORNEY, Secretary.
This announcement, however, does not interfere with the running of the special train of the New York, Ontario & Western, etc., which leaves New York City June 11, as heretofore announced.

Railroad Water Supply Superintendents.

The annual meeting of the Society of Railroad Water Supply Superintendents will be held at Cedar Rapids, Ia., June 13. The society has been formed for the discussion of all matters relating to hydraulic engineering as applied to railroad service. J. White, of the Burlington, Cedar Rapids & Northern, Cedar Rapids, Ia., is Secretary.

PERSONAL.

—Mr. T. L. Chapman, Superintendent Motive Power Chesapeake & Ohio, has resigned, taking effect June 1.

—Charles A. Beery, Superintendent of Telegraph of the Cincinnati, Washington & Baltimore, at Chillicothe, has resigned.

—Louis Brooksmith, Master Mechanic of the Indianapolis & Michigan City division of the Lake Erie & Western, has resigned.

—Col. W. P. Homan, General Manager of the St. Louis, Arkansas & Texas, has resigned, and the office has been abolished.

—H. S. Kolseth, formerly Master Mechanic of the Southern Division Boston & Lowell road, is now connected with the Westinghouse Air Brake Co.

—H. M. Burford, who has been Master Mechanic of the Memphis & Charleston, has been appointed Superintendent of Motive Power and Rolling Stock of the Texas & Pacific.

—David E. Dale, who for many years has been connected with the Pennsylvania as Engineer and Supervisor, and latterly on the New York division as Supervisor, has resigned.

—Ford Woods, the newly appointed General Freight Agent of the Ohio, Indiana & Western, has been Assistant General Freight Agent on the same line the last four years. He is 38 years old.

—L. B. Rock, well known in railroad circles, and who had retired from the Superintendency of the Northern Division of the Chicago, Milwaukee & St. Paul last April on account of ill health, fell down a stairway at his home in Milwaukee, Wis., May 28, and was killed. It is thought he was stricken with paralysis, as he has suffered from this before. He was 63 years old.

ELECTIONS AND APPOINTMENTS.

Atlantic, Atlanta & Great Western.—Col. W. H. Pryor, of Lynchburg, Va., has been appointed Chief Engineer.

Atlantic & Pacific.—At the annual meeting in Boston the following directors were elected: Henry C. Nutt, Jesse Seligman, C. P. Huntington, William I. Buckley, Walter L. Frost, Bryce Gray, W. B. Strong, I. T. Burr, B. H. Cheney, A. N. Nickerson, G. O. Shattuck, L. C. Wade.

Battle Creek & Bay City.—W. L. Bridgen, of Battle Creek, is the Chief Engineer of this road.

Burlington, Cedar Rapids & Northern.—At the annual meeting in Cedar Rapids, Ia., May 22, the stockholders elected C. J. Ives, C. D. Close, J. Carscadden and Thomas Hayes directors for three years. All the old officers were re-elected.

The following officers were elected at the annual meeting in Cedar Rapids, Ia., May 22: C. J. Ives, C. D. Close, J. Carscadden, and Thomas Hayes for three years. All the officers were re-elected. The executive committee is as follows: J. B. Blythe, of Burlington; J. C. Peasley and R. R. Cable, of Chicago; and E. S. Bailey, of Clinton, Ia.

Carolina, Cumberland Gap & Chicago.—The following are the officers of this company: R. E. Bowen, President, Briggs P. O., Pickens County, S. C.; T. G. Croft, Vice-President, Aiken, S. C.; T. P. Cotteran, Secretary and Treasurer, Abbeville, S. C.

Chicago, Burlington & Quincy.—E. P. Ripley has been appointed Traffic Manager, and Paul Morton has been appointed General Freight Agent. For the present Mr. Morton will continue to act as General Passenger Agent.

Choctaw Coal & Railroad.—E. D. Chadick, of Denison, Tex., has been elected General Manager of this new Texas company.

Columbia & Puget Sound.—The following officers were elected at the annual meeting, May 16: President Elijah

Smith; Vice-President, A. A. Denny; Secretary, T. H. Tyndale; Superintendent, T. J. Milner.

Concord.—At the annual meeting held at Concord, N. H., May 29, the following directors were elected: Fred Smyth, W. M. Parker, Josiah Minot, B. A. Kimball, John H. Pearson and John A. White, of Concord, and A. J. Pillsbury, of Tilton. Ex-Gov. Smyth was re-elected President and Wm. M. Chase, of Concord, Secretary.

Dayton & Fausdale.—The following are interested in this new Alabama company: R. W. Price, of Dayton; G. L. Siddons, J. H. Minge and John F. Watkins, of Fausdale; J. J. King, of McKinley; S. F. Woolf and W. Cunningham, Jr., of Linden.

Delaware Bay & Cape May.—At the annual meeting at Cape May, N. J., this week, directors were elected as follows: William J. Russell, John Burton, Alexander E. Harvey, Henry Crawford, William J. Allen, Amos B. Hadley, Edward S. Wyckoff.

Flint & Pere Marquette.—J. R. Reniffe has been appointed Master Car-Building, with headquarters at East Saginaw, Mich. W. H. Schofield, Jr., General Superintendent, Arker, S. C.; W. Schofield, General Financial Agent, New York.

International & Great Northern.—J. M. Eddy has been appointed General Manager, with office at Palestine, Texas.

Jeffersonville, Madison & Indianapolis.—At the annual election held at Jeffersonville, Ind., May 23, the following directors were elected: J. N. McCullough, Wm. Thaw, T. D. Messler, J. P. Green, W. H. Barnes, W. Irwin, James McCrea, S. H. Patterson, J. L. Bradley, J. Irwin, F. M. Swope and S. C. Taggart. The directors elected George B. Roberts, President; J. E. Davidson, Treasurer, and S. B. Liggett, Secretary.

Kansas City, El Paso & Mexican.—The following are the officers of this company: Benjamin F. Hammett, President; Henry L. Newman, Vice-President; C. R. Morehead, Secretary and Treasurer; C. S. Martin, Chief Engineer. The general offices are in El Paso, Tex.

Kentucky Union.—At the annual meeting in Louisville, Ky., last week, the following directors were elected: Henry C. McDowell, Alexander P. Humphrey, George W. Davie, W. R. Belknap, John E. Green, St. John Boyle, C. H. Stoll, of Lexington, and F. D. Carley, of Louisville; F. D. Carley was chosen President, H. C. McDowell, Vice-President, and Leon T. Rosengarten, Secretary and Treasurer.

Lime Rock.—The officers of this road are as follows: William T. Cobb, President; Parker Spofford, Chief Engineer; H. N. Pierce, Secretary and Treasurer. The general office is in Rockland, Me.

Los Angeles County.—S. P. Rees is Secretary and Treasurer, and R. C. Shaw is Superintendent. The general office is in Los Angeles, Cal.

Louisville Southern.—A. J. Porter has been appointed superintendent, with office in Louisville, Ky.

Manitoba Central.—The officers of this company are as follows: President, Duncan MacArthur; Vice-President and Managing Director, Col. T. C. Scoble; Secretary, C. N. Bell. The general office is at 439 Main street, Winnipeg.

Meredith & Conway.—The following officers and directors were elected at a meeting in Concord, N. H., May 28: President, Joseph Wentworth, Concord; Secretary, B. H. Corning; directors, Joseph Wentworth, Samuel N. Bell, B. H. Corning, Charles E. Bussel, Warren Daniels, A. J. Pillsbury and F. E. Goodale.

Meriden, Waterbury & Connecticut River.—The following have been elected officers and directors of this consolidated company: President, H. C. Wilcox, Meriden; Vice-President, E. D. Steele, Waterbury; Secretary and Treasurer, George Rockwell, Meriden; Assistant Treasurer, H. L. Wade, Waterbury; Auditors: C. L. Rockwell and A. Chamberlain, Meriden. Directors: H. C. Wilcox, George R. Curtis, Samuel Dodd, C. L. Rockwell and A. Chamberlain, of Meriden; A. S. Chase, H. L. Wade, E. D. Steele and H. A. Matthews, of Waterbury.

Middletown, Unionville & Watergap.—The following directors were elected at a meeting in New York May 28: Frederic A. Potts, Stephen V. White, Senior Borg, Charles Minzesheimer, Henry Marks, Robert K. Dow, James M. Hartshorne, Garrett A. Hobart, Charles V. Ware, John P. Rafferty, Frederic P. Moore, Isaac G. Demarest and Cornelius T. Demarest.

Missouri, Kansas & Texas.—The following officers have been elected: President, R. V. Martensen; Vice-President, H. K. Enos; Second Vice-President, William Dowd.

New Orleans, Natchez & Fort Scott.—The following officers were elected at a meeting in Hot Springs, Ark., last week: President, John H. Rice, of Fort Scott, Kan.; Vice-President, D. C. Rugg, of Hot Springs; Secretary and Treasurer, W. D. Leiper, of Malvern, Ark.

New York, Mahoning & Western.—John K. Brice has been appointed Auditor, and Q. A. Thomas has been appointed Chief Engineer, vice John K. Brice. Samuel Craig is Engineer of the Plymouth Division and Henry Ray of the Findlay Division.

Ohio, Indiana & Western.—Ford Woods has been appointed General Freight Agent, with office in Indianapolis, Ind., to succeed H. C. Diehl, recently resigned to take the management of the Inter-state Dispatch. E. H. Sessions will succeed Mr. Woods as Assistant General Freight Agent.

Ohio River.—At the annual meeting in Parkersburg, W. Va., May 22, the following directors were elected: J. N. Camden, W. N. Chancellor, J. N. Camden, Jr., and George W. Thompson, of Parkersburg; J. G. Fair, of San Francisco; Charles Pratt, W. P. Thompson and O. H. Payne, of New York; E. W. Clark, J. P. Hsley, of Philadelphia; R. H. Browne, of Grape Island, W. Va.; R. S. Brown, of Ravenswood, W. Va., and C. H. Harkness, of Cleveland, O.

Paris, Choctaw & Little Rock.—The following are among the incorporators of this company: L. J. Wright, J. H. Johnson, S. B. Maxey, Harrison Chesum, Allen McCrummen, Martin Vasmer, Walker Hubbard, Hathaway Scott, Baldwin Craig, of Paris, Tex.

Peterborough.—At the annual meeting in Nashua, N. H., May 23, the officers and directors were elected as follows: Directors, Edward Spalding, George A. Ramsdell, Virgil C. Gilman, of Nashua; S. A. B. Abbott, of Boston; Thomas B. Eaton, of Worcester; Charles E. A. Bartlett, of Lowell; Secretary, Harry W. Ramsdell, Nashua; Treasurer, G. G. Shattuck, Nashua.

Puget Sound Shore.—At the annual meeting the officers were elected as follows: President, Sydney Dillon; Vice-President, A. A. Denny; Secretary and Treasurer, T. H. Tyndale; Manager, T. J. Milner.

Pittsburgh, Fort Wayne & Chicago.—The following directors were elected at the annual meeting in Pittsburgh: I. N. McCullough, Pittsburgh; Charles Lanier, Henry Amy, and W. W. Astor, New York. The latter succeeds to the vacancy caused by the death of Gen. George W. Cass.

Savannah & Columbus.—The first board of directors of this company is as follows: E. P. Alexander, J. L. Warren, J. J. Wilder, T. M. Cunningham and A. R. Lawton, Jr., of Savannah, Ga.; and D. M. Hughes, of Twiggs County.

Tennessee Midland.—The following appointments have been made: Ben Wilson to be General Manager, J. P. Meredith to be Superintendent and J. T. Garner to be General Freight and Passenger Agent, all with office in Memphis, Tenn.

Texas & Pacific.—H. N. Burford has been appointed Superintendent of Motive Power and Rolling Stock, with headquarters at Marshall, Tex., to fill the vacancy occasioned by the resignation of Jacob Johann.

Uniontown, Newberne & Dayton.—The incorporators of this Alabama company are as follows: J. C. Welch, S. S. Pickering, B. F. Harwood, Carl Earnest, A. D. Pitts, J. H. White, T. G. Fowler, E. W. Booker, T. Corcoran, M. Marx and J. M. Sadler, of Uniontown.

Union Pacific.—C. S. Wells has been appointed Purchasing Agent, with headquarters at Omaha, Neb.

Western Ontario.—The following are named as the first board of directors of this company: David Jackson, Jr., James Isbester, McLeod Stewart, Clarence W. Moberly, Frank Caverhill, Alexander MacLean, Joseph H. Ferguson, Alexander Macpherson and John D. Irwin. The general office is to be in Toronto, Ont.

Winona & Southwestern.—Thomas Simpson, of Winona, Minn., is the Secretary of this company.

Wyoming Midland.—The first board of directors of this new Wyoming company is as follows: Nelson W. Brewster, Thomas Franklin, Jacob Hitchcock, Douglas Smith and Charles F. Roberts, all of New York City.

OLD AND NEW ROADS.

New Companies Organized.—Bismarck, De Smet & Sioux Falls.—Clearmont & Kinzua.—Dayton & Fausdale.—Hot Springs & Western.—Kansas City, Richfield & Trinidad.—Meriden, Waterbury & Connecticut River.—Wyoming Midland.—Savannah & Columbus.—Uniontown, Newberne & Dayton.

Alexandria & Arcadia.—Negotiations are being made for the construction of this road, which has been surveyed from Arcadia, La., north about 50 miles to the Arkansas line. A. L. Atkins, Arcadia, La., is President.

Anniston & Atlantic.—It is stated that the road has been purchased by the Central of Georgia. It is a narrow gauge extending from Anniston to Sylacauga, 53 miles, and connects at the latter place with the Columbus & Western Division of the Central of Georgia.

Atlantic, Atlanta & Great Western.—President Geo. T. Fry has negotiated with S. Morris Pryor & Co., of New York, an issue of \$3,000,000 six per cent. 30-year bonds. They are issued at the rate of \$12,000 per mile, and the Mercantile Trust Co., of New York, has been appointed trustee.

The surveys were commenced this week, and the contracts for construction will be let Aug. 1. The distance between Atlanta and Savannah will be 240 miles, and the shortest route between the two cities by 54 miles. It is said that the road will be completed to Eatonton by July, 1889, and to Savannah by July, 1890. William H. Pryor, Atlanta, Ga., is Chief Engineer.

Beaver Creek & Cumberland Coal Co.—The contract has been let to R. H. Young & Co., of Louisville, Ky., for a 2½ mile extension of the company's narrow gauge road from the present terminus at Beaver, Ky. Thomas D. Lovett, Cincinnati, O., is Consulting Engineer.

Beaver Creek Valley.—Subscriptions are being obtained for this road, which it is proposed to build from North Brookfield Station, N. Y., on the Delaware, Lackawanna & Western, through the village of North Brookfield to Brookfield, six miles.

Birmingham Mineral.—The Gate City extension has been completed and it will probably be soon extended to Trussville, Ala.

Bismarck, De Smet & Sioux Falls.—Organized at De Smet, Dak., to build a road from Sioux Falls to Bismarck, passing through the county seats of the intermediate counties.

Boston & Maine.—A committee of three directors of the road have been appointed to negotiate with a committee of directors of the Eastern road concerning the proposed consolidation of the two roads.

Cape Fear & Yadkin Valley.—The second survey for the extension from Fayetteville to Wilmington, N. C., has been completed from the latter city to beyond Point Castwell, and it is expected that the location of the entire line will be completed about July 15. Grading is to be commenced by June 15.

Cape Girardeau & Southwestern.—The 18-mile extension from the present terminus at Wappapelo, westerly to Williamsville, Mo., on the St. Louis, Iron Mountain & Southern, has been completed for about 7 miles to a point beyond Chaonia, in Wayne County. The contractors between Chaonia and Williamsville are Jacob Zimmerman and P. O. Hare, both of Chaonia, and G. Kilkinny, of Williamsville. There is a 700-ft. tunnel on this extension through the divide between the Black and St. François rivers, which is now being constructed.

Carolina, Knoxville & Western.—The grading on the first 25 miles from Greenville, S. C., northerly toward the North Carolina state line has been nearly completed, ready for tracklaying. That part of the road in North Carolina, about 65 miles, has all been let and grading is also progressing from the Knoxville end of the line.

Central of Georgia.—The freight house of the Columbus & Western Division at Birmingham, Ala., which is 300 x 50 ft., is nearing completion, and the contract has been let for an 11 stall round-house with a 60 ft. iron turn-table. The large yard (nearly 13 acres) is being rapidly graded and being made ready for the opening of the road.

Grading on the Eufaula & East Alabama, from Dayton to Ozark, Ala., 40 miles, is completed, and the track has been laid for about 20 miles.

Between Atlanta and Macon, Ga., 3,000 tons of 68½ lb. rail is now being laid, and on the Port Royal & Augusta branch, 1,500 tons of 61½ lb. rail is being laid.

Central of New Jersey.—Surveys have been completed for the proposed extension of the Lehigh & Susquehanna from Phillipsburgh north 12 miles to Belvidere, where connection will be made with the Lehigh & Hudson River. The right of way is being secured, and it is stated that work will soon be commenced.

Chattanooga & Lookout Mountain.—The road was opened for business its entire length, May 29. It is eight miles long, extending from Chattanooga, Tenn., up Lookout Mountain. It is standard gauge with grades of 180 ft. to the mile.

Chicago, Hannibal & Springfield.—A survey will probably soon be commenced from Havana, Ill., southwest to Hannibal, Mo., by W. E. Williams, the Chief Engineer.

Chicago & Indiana Coal.—Work has been resumed on the extension from a point north of Goodland, Ind., to the Illinois state line, a distance of 20 miles, to connect with a branch of the Chicago & Eastern Illinois, being built from Momence to the Indiana State line, a distance of 11 miles.

Chicago, Kansas & Nebraska.—A force of graders has commenced work at Caldwell, Kan., on an extension through the Indian territory. Caldwell is in Sumner County, almost directly on the boundary line of the Indian Territory, and is the terminus of the extension of both the Chicago, Kansas & Nebraska and the Atchison, Topeka & Santa Fe.

Chicago & Northwestern.—The extension known as the Lake Geneva & State Line Railway, which extends westerly from Lake Geneva, Walworth County, Wis., along the north shore of Lake Geneva to William's Bay, in the same county, a distance of 6 miles, will be opened for business June 1.

Clearmont & Kinzua.—Incorporated in Pennsylvania for the purpose of constructing a road from Reynolds, McKean County, to a connection with the Pittsburgh & Western at Lafayette Station, in the same county, a distance of about five miles. The capital stock is \$100,000. G. W. Campbell, Kane, Pa., is President.

Cleveland & Mahoning Valley.—The company has filed for record in Youngstown, O., a copy of the new consolidated mortgage of \$3,000,000 recently authorized by the stockholders, for double tracking the road between Cleveland and Youngstown.

Dayton & Fannsdale.—Incorporated in Alabama to construct a standard gauge road from Dayton, Marengo County, northerly about eight miles to Fannsdale, on the East Tennessee, Virginia & Georgia. The capital stock is \$50,000.

Decatur, Chesapeake & New Orleans.—Subscriptions to the company to the amount of \$425,000 have been voted on that part of the line between Decatur, Ala., and Shelbyville, Tenn., a distance of 76 miles. The preliminary work on this part of the line, ready for construction, has now been almost completed, and the contracts will be let very soon. G. C. Sandusky, Shelbyville, Tenn., is President.

Eastern, of Minnesota.—The contract has been let to P. Brennen, of St. Paul, Minn., for the tracklaying on the entire road, and work will probably be commenced this month.

Forest City & Southeastern.—Grading has been commenced on this road, and about one mile finished. The road is projected to extend from Forest City, D. T., south-east to Sioux Falls, Ia. R. M. Springer, Forest City, is Vice-President.

Forest City & Watertown.—Work has been suspended on the grading of the road, after 35 miles had been completed, from Forest City northeasterly toward Bowdle, D. T., on the Chicago, Milwaukee & St. Paul, to which point (50 miles from Forest City) the survey has been completed.

Georgia, Carolina & Northern.—Tracklaying has now been completed from Monroe, N. C., a distance of 22 miles, to the Catawba River, over which a large bridge is to be built soon. The grading to Chester has been completed, with the exception of a section near Chester, which is being finished by Coleman & Rice. Alexander, Stuart & Sullivan, of Chester, Pa., have contracted for the building of an additional section of three miles of heavy work, which is to be completed by Sept. 15.

Georgia Pacific.—The location for the extension from Columbus westerly to Winona, Miss., about 78 miles, has been almost completed and the contracts for constructing the road will be let June 21. Grading has been commenced between Johnsonville and Winona. J. Y. Sage, Birmingham, Ala., is General Manager.

Grand Trunk.—The contract for laying a second track on the road between Coteau, Que., and Cornwall, Ont., has been let to J. A. McMahon, W. W. Shea and George A. Begy, of St. Catharines, Ont. The contract price is \$150,000.

Gulf, Colorado & Santa Fe.—The contract for constructing the extension southwest from Ballinger to San Angelo, Tex., 36 miles, has been let to Ricker, Lee & Co., of Galveston, on their bid of \$40,000. Work will probably commence this week.

Hancock & Calumet.—A three-mile branch is being surveyed south from a point on the main line, to Woodstock, Mich., which it is expected will be completed this summer. Charles A. Wright, Hancock, Mich., is General Manager.

Hartford & Connecticut Western.—The bill to give the company a special charter to build a branch from Tariffville, Conn., to Springfield, Mass., has been defeated in the Massachusetts legislature. The company can, however, build the extension under the general railroad law.

Helena, Tupelo & Decatur.—It is expected that the survey for this road will be commenced in July. It is projected to extend from Helena, Ark., through Oxford and Tupelo, Miss., and Isbell, Ala., to Decatur. H. C. Medford, Tupelo, Miss., is Secretary.

Hot Springs & Western.—Chartered in Arkansas, with a capital stock of \$150,000, to build a line from Hot Springs, on the Ouachita River, in Garfield County, with a branch northerly to near Glazier Creek, a total distance of 15 miles.

Iwaco & Shoalwater.—Work is being actively pushed on this road, and part of the grading has been finished, and it is thought that tracklaying will be commenced immediately on the portion graded, many of the rails having already been delivered. Some difficulty has been found in securing the right of way over a tract of land near Shoalwater Bay, and it has been decided not to continue the road to that point unless the matter can be arranged to the satisfaction of the directors of the road.

Kansas City, El Paso & Mexican.—Negotiations are being made for securing the right of way from El Paso,

Tex., to White Oaks, N. M., and further northward. The contract for constructing the road has already been let to Morris R. Locke & Co. It is said that the Atchison, Topeka & Santa Fe is endeavoring to secure control of the narrow passes in Lincoln County, New Mexico, in an effort to prevent the building of the road.

Kansas City, Fort Scott & Gulf.—The survey has been commenced for an extension of the Rich Hill branch from its present terminus at Carbon Centre southeast about 30 miles to El Dorado Springs, Mo.

Kansas City, Fort Smith & Southern.—The claims of the contractors who last year graded part of this road, have been paid in full by Mathias Splitlog, of Neosho, Mo., President of the Splitlog Construction Co. The graded part of the road extends from Neosho, Mo., south 15 miles and north about 20 miles to Joplin, and 6 miles of track have been laid. It is expected to recommence work July 1, and it is stated that funds have been secured to complete 60 miles. B. F. Requa, Neosho, Mo., is Secretary of the railroad company.

Kansas City, Memphis & Birmingham.—A preliminary survey is being made from Aberdeen, to Columbus, Miss., a distance of about 28 miles by Assistant Engineer John Foster. The contracts for grading and tracklaying will be let soon after the survey is completed.

Kansas City, Richfield & Trinidad.—Incorporated in Kansas to construct a road from Wichita, Kan., to Trinidad, Col., an estimated distance of 470 miles. The line will pass through the counties of Sedgwick, Kingman, Pratt, Kiowa, Clark, Mende, Seward, Stevens and Morton. The capital stock is \$2,000,000, and the principal office is to be at Richfield.

Kansas City, Wyandotte & Northwestern.—The surveys, which were being made north from Seneca, Kan., toward Nebraska, have been ordered discontinued.

Kentucky Midland.—It is stated that active construction work will be commenced in a few days at Frankfort, continuing east to Georgetown, Paris and Owingville, Ky.

Lake Superior & Pacific.—Contracts will be let during July for constructing part of the road which has been surveyed from Duluth northwest for about 100 miles toward a connection with the Red River Valley road. J. R. Myers, Duluth, Minn., is President.

Lehigh Valley.—It is stated that the directors have made a new and more favorable contract with the New York, Lake Erie & Western for track rights between Elmira and Buffalo, and that they have therefore decided to indefinitely postpone the construction of the projected extension from Geneva to Buffalo.

Line Rock.—The contract for building that portion of the road between the Knox & Lincoln road and the North End of Rockland, Me., about four miles, has been let, and is to be completed by Aug. 15. The road is to be built for the purpose of bringing lime rock from the quarries to the kilns in Rockland and will be practically a belt line around the city, connecting the Knox & Lincoln with the quarries. It will be about seven miles long. There are 60 kilns situated on the water front of the city to be supplied with the rock. The quarries lie in a vein of lime rock about one and a half miles from the bay. About a mile of this road near the kilns, with the sidings to the kilns, will be upon hard pine trestles, and as the kilns are of different elevations and some 35 ft. above the level of the sea and built without reference to alignment, very sharp curves and heavy grades will be required upon the spurs to the different kilns.

Little Rock & Alexandria.—The franchises of the road have been sold to an English syndicate, which, it is said, will place the road under contract immediately. It is projected to extend from Little Rock, Ark., to Alexandria, La. S. M. Markle, St. Joseph, Mo., is President.

Los Angeles County.—The directors have recently authorized the issue of \$240,000 bonds for purchasing equipment and extending the road. The American Loan & Trust Co., of New York, has been appointed trustee.

We learn from the President of the road that the grading is nearly all completed from Los Angeles to Santa Monica, Cal., on the Pacific Ocean, 18 miles, and tracklaying has been completed for about six miles. It is expected that the entire road will be finished by July 1.

Louisville & Nashville.—Surveys are being made, and it is stated that the contracts have been let, for the extension of the Cumberland Valley branch from Pineville, Ky., to Cumberland Gap and toward Norton, where connection is to be made with the Clinch Valley extension of the Norfolk & Western which is now being built to the latter point.

Tracklaying on the Huntsville extension was commenced this week at Boyles, Ala., near Birmingham, and will soon be completed to Village Springs, a distance of 18 miles, beyond which the road has not as yet been graded.

The company has stated that the proposed branch from Hopkinsville, Ky., to Cadiz, 10 miles, will be built if a subsidy of \$30,000 is given.

Louisville Southern.—The road is now completed, and running to Bergin, Ky., where connection is made with the Cincinnati, New Orleans & Texas Pacific.

Macon & Dublin.—A locating survey has just been completed from a connection with the Covington & Macon, to a point in Twiggs County, Ga., and it is stated work will be commenced soon. A. C. Machen is interested.

Manitoba Central.—The contract for tracklaying from Winnipeg to the International boundary at West Lynne, a distance of 71 miles, has been let to J. D. McArthur, of Winnipeg, at \$200.93 per mile. A branch has been surveyed from Winnipeg 65 miles to Portage la Prairie. The bonds of the company, to the extent of \$5,000 per mile are guaranteed by the Provincial Government, the interest on the bonds, not guaranteed, being the first charges upon the company's earnings after payment of operating expenses.

The above is the official title of the road commonly called the Red River Valley.

Marietta, Columbus & Northern.—A short branch is being constructed from Big Run Station, southeast to Stewart, O. Surveys have also been made from Sharpsburg to McCluney, on the Cincinnati & Muskingum Valley, and also from Amesville to Corning, O.

McKeesport & Belle Vernon.—Grading is in progress on the road at Reynoldton, Pa., and it is expected that tracklaying will be commenced this month from a connection with the Pittsburgh, McKeesport & Youghiogheny through Reynoldton toward Elizabeth, Pa. J. Wainwright, Pittsburgh, Pa., is President.

Memphis, Arkansas & Texas.—A survey has been made for the road from Memphis, Tenn., southwest to a point on the Arkansas River, near Pine Bluff, Ark., and the report of the chief engineer, as to the cost of constructing the road, is being considered by the directors. George Arnold, Memphis, Tenn., is President.

Meriden, Waterbury & Connecticut River.—The stockholders of the Meriden & Cromwell and Meriden & Waterbury roads have voted to consolidate under the above name. This gives a line 27 miles long, from Cromwell, through Meriden to Waterbury, Conn.

Michigan Central.—The company will build a \$60,000 depot at Bay City, Mich., this summer. The plans have already been decided upon.

Milwaukee, Lake Shore & Western.—A force of about 300 men are at work on the extension northwest from Rhinelander, and it is expected that it will be completed to Tomahawk Lake within a month. The bill granting the company right of way through the Flambeau Indian Reservation has passed Congress.

Mississippi River & Bonne Terre.—The surveys have been nearly all completed for this road, which is to extend from Bonne Terre, Mo., about 30 miles, to a point on the Mississippi River, at Crystal City. The contracts for five miles have been let. Financial arrangements have all been consummated. James B. Wilde, Bonne Terre, Mo., is interested.

Monticello, Fallsburgh & New York.—The survey is now being made for this road, which is to extend from Monticello to Fallsburgh, N. Y. E. Canfield, Middletown, N. Y., is Chief Engineer.

Moss Point & Waynesborough.—Citizens of Moss Point, Miss., have organized to build a road from a point on Pascagoula Bay north to Waynesborough, on the Mobile & Ohio, an estimated distance of 90 miles. J. W. Griffin, Walter Denny and others, of Moss Point, are interested.

Nashville, Florence & Sheffield.—Tracklaying has been commenced at Florence, Ala., and is working toward the force laying track from Ironton.

Nashville & Knoxville.—The road has been completed east to Watertown, Tenn., 18 miles from Lebanon, and it is thought that Carthage will be reached by July 1. The second survey for the five-mile branch to Alexandria, Tenn., has been made and the right of way is being secured.

Natchitoches.—J. Parker has been awarded the contract for ballasting the road. It is stated that negotiations are being made for consolidation with the Arkansas & Louisiana, and other short lines now in operation, so as to make a through line from Lake Charles to Hope, Ark.

New Roads.—A company is being organized in Washburn, Wis., to construct a road from Bayfield and Washburn southerly to a point below Ashland Junction, at or near Prattsburg. It is said to be in the interest of the Chippewa Falls & Ashland road.

New York, Susquehanna & Western.—The work of double tracking the road between New Durham and Little Ferry Junction, N. J., about three miles, is progressing rapidly.

Northern California.—Surveys are being made for a proposed extension from Marysville to Knight's Landing, Cal.

Northern Pacific.—The Cascade tunnel was opened for traffic May 27, and hereafter trains will run regularly through the tunnel, the switchback being only used for tourist trains.

Ohio River.—It is stated that the funds have been secured for building the extension from Ravenswood to Spencer, W. Va., and that construction would be commenced this season. The line has already been surveyed.

Oregon Railway & Navigation Co.—Grading has been commenced on an 18-mile section of the branch which is being built from a point near Castle Rock, southeast to Heppner, Ore., and it is thought that it will be completed by Aug. 30.

Orlando & Winter Park.—Tracklaying will probably soon be commenced on this Florida line, which has already been graded. It is also stated that work on the Osceola & Lake Jessup road, which is to extend from the main line to Lake Jessup, Fla., 13 miles, will also soon be commenced. J. H. Abbott, Orlando, is Chief Engineer.

Pittsburgh, Akron & Western.—Local aid for the construction of the road is being secured, and it is stated that grading will commence in a few weeks at Carey, O., and continue toward Akron. William Semple, of Allegheny, Pa., is President.

Pontiac Pacific Junction.—The contracts for the extension from Black River to Pembroke, Ont., a distance of 14 miles, will probably be let the early part of July. W. Hale Harris, Aylmer, P. Q., is Chief Engineer.

Port Jervis, Monticello & New York.—It is stated that the locating survey is being made for a proposed extension from the present terminus at Monticello, N. Y., north west, via White Lake to Jeffersonville, about 18 miles.

Providence & Stonington Steamboat Co.—Boston papers announce that the "Stonington line" rail from Boston to Stonington and steamer thence to New York will be discontinued, and that the boats of this company will be run between New York & Providence, to connect with a steamboat train to be run between Boston and Fox Point in Providence harbor.

Quincy & Beardstown.—The survey which has been made from Quincy eastward to La Grange, Brown County, Ill., a distance of about 48 miles, but which it was necessary to stop on account of the rising waters, will soon be resumed and pushed to completion. William H. Govert, Quincy, Ill., is Secretary.

Quincy, Omaha & Kansas City.—The survey for a proposed extension from the present terminus at Trenton, Mo., to St. Joseph has been commenced.

Roanoke & Tar River.—The construction of an extension south from Beverly to Lewiston, N. C., will soon be commenced, and it is expected that it will be completed by July 15.

St. Paul, Alexandria, Jennings, Lake Arthur & Gulf.—The survey for the road, which has already been made from Alexandria to Jennings, La., about 72 miles, is being continued south to Lake Arthur, to which it will probably be completed this week. When built the road will extend from Alexandria to Vermillion Bay on the Gulf of Mexico, and will be 130 miles long.

St. Paul, New Ulm & Southwestern.—A preliminary survey for the first 75 miles of the road from New Ulm toward Carver, Minn., has been commenced. In New Ulm \$10,000 stock has been subscribed by citizens. W. C. Bredenhager, Carver, Minn., is President.

San Antonio & Aransas Pass.—The statement is now made that instead of reaching Laredo, Tex., by a third rail over the Mexican Central from Collins, it is the intention of the company to build an independent line.

San Luis Valley.—The company is being organized to build a road from La Jara or Antonio, Conejos County, Colorado, northerly about 60 miles to Saguache.

Santa Ana, Fairview & Pacific.—Tracklaying has been completed from Santa Ana, Cal., for over four miles, and the rails to complete the remaining four miles of the road have arrived.

Savannah & Columbus.—Articles of incorporation have been filed in Georgia to build a road from a point on the Central, of Georgia in Effingham or Chatham counties, at or near Eden, thence through Americus and Buena Vista to Columbus. Branches are also to be constructed to Dublin, Laurens County, and to a point on the Central of Georgia, in Quitman County. The capital stock is \$1,000,000, and the principal office is to be in Savannah.

Savannah, Florida & Western.—Tracklaying has now been completed for three miles south from Thomasville, Ga., toward Monticello, Fla., on the Thomasville, Tallahassee and Monticello road. Louis McLain, Thomasville, Ga., is the contractor.

Seattle, Lake Shore & Eastern.—The map of the location of the Spokane Falls extension for 38 miles west of that place has been approved by the Secretary of the Interior and filed in the United States Land Office. Grading has already been commenced.

Silverton.—About 7 miles of this narrow gauge road, between Silverton and Red Mountain, Col., have been completed, and it is expected that the entire line from Silverton to Red Mountain will be completed by July.

South Atlantic & Ohio.—It is rumored that the Richmond & Danville has secured control of this company, which is building a line from Bristol, Tenn., to Big Stone Gap, in the Cumberland Mountains, and has over 40 miles in operation. If this is correct, and the purchase and extension of the Danville & New River is consummated, the Richmond & Danville would control an independent line from the Gap to the seaboard.

Southern & Western Air Line.—Grading has been commenced on this road near Fallston, Cleveland County, N. C., near Shelby, and work is continuing toward Cleveland's Mills in the same county. The road is to extend from Shelby through Morganton to Cranberry, N. C., near the Iron Mountains, an estimated distance of 80 miles. S. McD. Tate, of Shelby, is President.

Springhill & Oxford.—Grading has been resumed on the road, and the seven mile section between Oxford and Salt Springs is being rapidly pushed forward by McDougall & Charters, the sub-contractors.

Springfield, Shelbyville & Mt. Carmel.—Arrangements are being made to have the survey continued from Effingham to Mount Carmel, Ill. Between Springfield and Effingham the survey has already been made. J. P. M. Howard, Effingham, Ill., is President.

Stockton & Tulare.—The tracklaying has been completed from Fresno, Cal., southward for over 65 miles, and the grading has been finished for some distance beyond. The Pacific Improvement Co. are the contractors. They are also building from Tracy southward on the San Pablo & Tulare extension road, and from Huron westward on the Goshen division.

Tacoma, Ellensburg & Conconully Railway & Navigation Co.—The preliminary survey for the railroad to be built by this company has been completed, and the location is now being made and the right of way secured. L. E. Post, Tacoma, W. T., is President.

Tavares, Apopka & Gulf.—A receiver has been ordered for this road on the petition of the Central Trust Co., of New York. Trustee. The bonded indebtedness of the company is \$385,000, secured on the entire property, including the land grant of 507,466 acres, on the 55 miles of the road between Tavares and Kissimmee, Fla. Only 27 miles from Tavares are, however, in operation.

Tennessee & Coosa.—The contract for constructing the 76 mile extension from Gadsden to Huntsville has been awarded to Danforth & Armstrong, of Birmingham, Ala. Work will be commenced at Huntsville, Ala., next week.

Uniontown, Newberne & Dayton.—Articles of incorporation have been filed in Alabama to construct a road from a point on the Cincinnati, Selma & Mobile, at or near Newberne, through Uniontown, on the East Tennessee, Virginia & Georgia, and Dayton, to a point on the Tombigbee River, near the mouth of Beaver Creek. The capital stock is \$100,000.

Upper Coos.—Contracts will be let immediately for a two-mile extension from the present terminus at West Stewartstown, N. H., north to the Canada line, where connection will be made with the Herford road, the contract for which has been let and work commenced. B. F. Hancox, West Stewartstown, is Chief Engineer.

Utica, Adirondack & New York.—The survey for this road has been completed from Prospect through Grant to near Northwood, N. Y. R. W. Sherman, Utica, is Chief Engineer.

Vancouver, Klickitat & Yakima.—Tracklaying has been completed on the first five miles of the road from Vancouver, W. T., and the contracts for constructing 75 miles more, will be let in about 30 days. R. A. Habersham, Vancouver, is Chief Engineer.

Wyoming Midland.—Chartered in Wyoming to build a line from a point on the east side of Yellowstone Park southeast 200 miles to Linder. The capital stock is \$5,000,000.

Western Ontario.—A preliminary survey of about 60 miles of the road has been made, and it is expected that the location of the entire line from Port Hope, on Lake Ontario, to Inverhuron, Ont., on Lake Huron, an estimated distance of 176 miles, will be completed this year. The road will be a direct line between the two points, and will pass through a well settled farming country. C. W. Moberly, Toronto, is Chief Engineer.

West Virginia, Pineville & Tennessee.—The company will probably be permanently organized early this month, and surveys for the road will then be commenced. The road is to be built from a connection with the Louisville & Nashville at Pineville, Ky., along the valley of Straight Creek to the breaks of the Big Sandy. F. B. Reed, Louisville, Ky., is interested.

Wheeling & Lake Erie.—The engineers are now running a line for the proposed extension southeast from Bow-erstown, O., to Wheeling, W. Va., and contracts will probably soon be let.

Williamstown & Delaware River.—Tracklaying was commenced Monday on the seven-mile extension from Glassboro, the present terminus, to Mullica Hill, N. J.

Winona & Southwestern.—Two companies of surveyors are running lines for the road, and the negotiations for town subsidies are still in progress. The dispatch that grading had been commenced at Mason City, Ia., was erroneous.

Zanesville & Ohio River.—Tracklaying on the extension from Waterford, the present terminus, to Harmar, O., opposite Marietta, a distance of 22 miles, has been completed beyond Lowell, and will probably reach Harmar June 10.

TRAFFIC AND EARNINGS.

Railroad Earnings.

The following is a comparative statement of the earnings and expenses for the month of April:

Philadelphia & Reading R. R.	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$1,833,320	\$1,751,844	I. \$81,476
Expenses.....	950,631	837,277	I. 113,354
Net earnings.....	882,689	914,568	D. 31,879

Phila. & Read. Coal & Iron Co.	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$1,217,904	\$1,204,577	I. \$13,417
Expenses.....	1,099,568	1,170,328	D. 70,760
Net earnings.....	118,336	34,249	I. 84,176

Total of both companies:	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$3,051,314	\$2,956,422	I. \$94,892
Expenses.....	2,050,199	2,007,604	I. 42,594
Net earnings.....	1,001,115	948,817	I. 52,298

The statement for the five months ending April 30, 1888, as compared with the same period in 1887 shows:

A decrease in gross earnings of.....	\$2,512,459
A decrease in expenses of.....	1,020,718

A decrease in net earnings of.....	\$1,491,741
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The statement of the earnings and expenses of the New York, Lake Erie & Western for the month of April and the seven months to April 30, as compared with the previous year, is as follows:

Month of April:	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$2,112,650	\$2,048,997	I. \$63,653
Working expenses.....	1,393,531	1,359,874	I. 33,657

Due leased lines.....	\$717,125	\$689,123	I. \$28,002
Net earnings.....	184,378	189,875	I. 5,497

Net earnings.....	\$532,747	\$508,248	I. \$24,499
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Seven months—Oct. 1 to April 30:	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$15,354,592	\$14,869,070	I. \$485,522
Working expenses.....	10,158,051	9,688,660	I. 469,392

Due leased lines.....	\$5,196,541	\$5,201,010	D. \$4,469
Net earnings.....	1,352,187	1,320,373	I. 31,813

Net earnings.....	\$3,444,354	\$3,880,637	D. \$436,283
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The April net earnings for five years have been as follows:

1884, \$392,465; 1885, \$269,013; 1886, \$466,933; 1887, \$508,248; 1888, \$532,747.
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Earnings of railroad lines for various periods are reported as follows:

Month of April:	1888.	1887.	Inc. or Dec.	P. C.
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Balt. & Potomac.....	\$123,000	\$115,712	I.	\$7,287 6.1
Cam. & Atl. & Br.....	24,640	30,550	D.	5,910 16.6

Cam. & Atl. & Br.....	39,965	41,949	D.	1,984 2.4
Def. 3,457.....	1,684	1,684	I.	1,773 100.0

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Def. 3,457.....	1,684	1,684	I.	1,773 100.0
Def. 3,457.....	1,684	1,684	I.	1,773 100.0

Three months—Jan. 1 to March 31:	1888.	1887.	Inc. or Dec.
Eliz., Lex. & B. S.....	237,933	226,709	I. 11,224 4.9
Net.....	55,927	61,893	D. 5,966 8.2
Lake E. & W.....	447,224	502,230	D. 55,006 10.9
Net.....	149,562	170,035	D. 20,473 11.8
Scioto Valley.....	158,888	178,102	D. 19,214 10.7
Net.....	30,454	41,152	D. 10,698 24.4
Wabash.....	1,385,277	1,517,149	D. 131,872 8.6
Net.....	253,504	539,415	D. 285,911 52.8

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

Traffic Notes.

Rates by lake from Chicago to Buffalo advanced last week to 2 cents per bushel on corn, the rates prevailing before that, 1